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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

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Rehabilitation of the Cardiac

PHILIP R. LEE, M.D.

Dr. Lee introduces a provocative approach to the most common form of disability, one which does not lend itself to the usual process of physical repair or vocational training. Public Health Reports will welcome papers dealing with specific applications of Dr. Lee's philosophy.

REHABILITATION of the cardiac is a complex process, properly initiated by medical, social, psychological, and vocational evaluation of the patient.

The cardiac may be an infant with congenital heart disease, a youngster with acute rheumatic fever, a miner with cor pulmonale, an executive with acute myocardial infarction, a farmer with hypertensive cardiovascular disease, or an elderly housewife with chronic rheumatic heart disease. The various etiological types of heart disease must be differentiated in the light of increasing numbers of therapeutic approaches available. For example, the prophylactic use of penicillin to prevent streptococcal infection in youngsters who have recovered from rheumatic fever has prevented recurrent attacks of rheumatic fever and has thus enabled children to live lives nearer normal.

Impairment and Disability

The patient with heart disease may suffer no disability as a result of his disease or he may be totally disabled. Impairment and disability are often considered to be synonymous, but actually, total disability means the inability to engage in work commensurate with his previous training and his skills and aptitudes, while impairment refers to any structural or functional abnormality. The person who has heart disease may have an impairment of structure or

function without disability, or he may be totally disabled with only a minor impairment.

Heart diseases are often associated with a protracted course often with a gradual cumulative impairment, and with a clinical picture that may be complicated by physical, psychological, social, vocational, or economic dislocations.

There may be a short period of severe physical handicap and total disability, followed by complete functional recovery without disability, as in the case of the patient who suffers a heart attack; there may be a gradual progressive downhill course, as in some patients with chronic rheumatic heart disease; there may be a long period of relatively good health with death due to unrelated causes; there may be chronic ill health followed by complete surgical cure, as in many patients with congenital heart disease; or there may be years of little or no handicap terminated by a year or more of increasing ill health and finally death, as in certain patients with severe hypertension. Between the extremes of sudden death and normal life may occur all varieties of physical and functional impairment, as well as physical, psychological, social, and vocational handicap or disability among patients with cardiac disease.

The physical handicaps of the cardiac are most often a diminished tolerance for exercise, easy fatigue, shortness of breath, swelling of the ankles, or anginal pain. Other less common symptoms may occur as a result of heart disease. Psychological handicaps may be greater than the physical. They are likely to take the form of fear of sudden death, anxiety, depression,

Dr. Lee, who has written a number of articles on rehabilitation, is with the Palo Alto Medical Clinic, California.

overconcern about the heart, hostility or rejection.

Although the great majority of patients with heart disease are able to lead relatively normal lives despite some organic impairment and many are able to work productively in industry, to attend regular school, to labor on the farm, or to carry out the manifold duties of the housewife, any individual with heart disease may be severely handicapped.

Evaluation

Rehabilitation of the cardiac should begin the moment he is stricken. The first step in this rehabilitation is proper evaluation, including assessment of the physical, psychological, social, and vocational status of the patient. This may be accomplished by the family physician without the aid of the social worker, psychologist, vocational counselor, and consultant cardiologist. If any of the latter are required, however, it is the responsibility of the patient's physician to be sure their services are made available.

It has been estimated that for 80 percent of the cardiac patients evaluation and the management of the total rehabilitation program can be carried out by the patient's personal physician, but for 20 percent of the patients a team approach is essential if the patient is to achieve his maximum level of function in society.

The medical examination should include a careful, accurate, and thorough history as well as a complete physical examination and appropriate laboratory studies. The physician should also assess the patient's functional capacity. The patient may be able to perform the ordinary activities of life without distress, or may find it difficult if he is recovering from an acute cardiovascular illness or if he has many psychological problems which alter his subjective response to exercise.

After the physician has estimated the patient's functional capacity, he should evaluate physical and emotional stresses in the patient's daily life to determine if the patient has the capacity to continue his normal activities. Considerable information is now available for this assessment, not only on the energy cost of a variety of activities, but also on environmental

stresses and on the stresses imposed on individuals by their emotional reactions.

Emotional problems are often of greater importance in rehabilitation than the physical limitations imposed on the patient by his disease. The physician can usually determine the major emotional problems if he allows the patient sufficient time to relate the details of his illness, his concerns about himself, his family, job, and future. Occasionally it is necessary to have psychological testing or psychiatric consultation or both.

Of considerable importance in returning a patient to work is the patient's attitude. Jones used a simple method to classify patient's attitudes toward work which he found correlated rather well with success or failure in vocational rehabilitation. The following was his classification. Good: actively seeking employment and cooperative in attempts to help him; fair: willing to work, but doubtful of his ability to do so; poor: not seeking work and maintaining he had difficulty in working; and, bad: obstructing attempts to find him work and claiming his heart made him unfit. Of the patients with a good or fair attitude two-thirds were resettled in productive employment while only one-third of those with a poor attitude and none with a bad attitude were resettled.

If the psychological assets are positive and the patient is strongly motivated, much can be accomplished by the individual, even in the presence of severe organic heart disease. If the patient is not motivated and cannot become so, the physician and other members of the rehabilitation team are likely to accomplish little even if the patient has no physical limitation.

In evaluating the emotional status of a cardiac, especially a child, the patient's family must be considered. Often the family will make the difference between success or failure in rehabilitation. If they are understanding and cooperative they can be of immeasurable aid, but if they are overprotective, fearful, or rejecting, rehabilitation attempts may meet with failure.

Sociologic Factors

The physical and psychological aspects of cardiac rehabilitation have received considerably more attention than have many of the soci-

ologic factors despite the latter's importance in rehabilitation. Limitations placed on many cardiaques by their physicians severely restrict their social opportunities as do the employment policies of many industries and the current interpretation and administration of many of our workmen's compensation laws.

When the social and vocational status of any cardiac is evaluated, the fact that the majority of cardiaques can live relatively normal lives should be kept in mind. The majority who labor in industry, on the farm, in the home, or who attend school are better off continuing in their usual work or habits of life than by radically altering them when no clear-cut indication to do so exists.

Points to be emphasized in the social history are the psychological factors to which may be added family relationships, economic status, housing, and education. In the vocational history, information should be obtained on specific characteristics of the job or work place, operations or activities involved, environmental conditions, wages, group pressures or other social pressures on the job, previous vocational experience or training, skill, adaptability, and interests.

For children, appropriate emphasis must be placed on the family, on the child's intelligence, education, interests, motivation, and potential for future activities. In this instance, skill may be developed and patterns established, whereas in older cardiaques often the only realistic approach is to attempt to restore the patient to his usual habits of life and work.

Individualized Planning

Parallel with the evaluation is the individualization of the rehabilitation program. Although two patients have the same organic defect they will not have the same personality, nor will their habits or environmental stresses be the same. These factors must be considered when giving the patient advice about diet, drugs, physical activity, occupation, recreation, sexual activity, emotional stress, smoking, and the variety of day-to-day problems involved in his rehabilitation.

In what is perhaps the single most important step in the rehabilitation process, the physi-

cian's unhurried discussion with the patient about his disease, the emphasis should be on the more optimistic aspects, particularly regarding prognosis and the ability of the patient to return to a reasonably normal and productive life. The patient should be told in some detail how he can best arrange his life to fit the circumstances. Often it is advisable to outline treatment procedures as well as the overall rehabilitation program.

The rehabilitation of any cardiac may involve family members, nurses, teachers, social workers, vocational counselors, psychologists, psychiatrists, surgeons, cardiologists, occupational therapists, dietitians, industrial physicians, employers, union leaders, personnel directors, fellow workers, and friends. Although many disciplines and individuals may be employed in the rehabilitation program, the patient's personal physician must remain his guide from the time of initial illness until the goal of rehabilitation, namely the return of the patient to the best life he can lead with what he has left, is achieved.

Summary

1. Rehabilitation of the cardiac is a complex process properly initiated by medical, psychological, social, and vocational evaluation of the patient.
2. The rehabilitation program must be individualized to meet the specific needs of the patient.
3. The single most important step in the rehabilitation of the cardiac is the physician's unhurried discussion with the patient about the nature of his disease, its treatment, prognosis, and how he can best arrange his life to fit the circumstances.
4. The rehabilitation of the cardiac may involve many different people, with diverse skills, but the physician must remain the patient's guide until the patient has returned to the best life he can lead with what he has left.

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Revised Regulations for Tuberculous Immigrants

Aliens with tuberculosis who are permitted to immigrate to the United States are now required to go promptly to a hospital for examination and necessary medical care, according to a change in immigration regulations announced by the Immigration and Naturalization Service of the Department of Justice and by the Public Health Service. Hospitalization as an inpatient is not necessary if the responsible physician determines that outpatient care is adequate. Earlier regulations provided for hospitalization "if required," without stating details on enforcement.

Public Law 85-316 of September 11, 1957, contains a provision permitting an immediate family member of an American citizen or of a resident alien to immigrate to this country although afflicted with tuberculosis. Other aliens with this disease are barred from admission.

Before receiving an immigrant visa, the alien must submit a statement from a State, Territorial, or local health officer, or from the director or a physician staff member of a hospital recognized by the Public Health Service as an institution for the treatment of tuberculosis, agreeing to supply any treatment and observation required for proper management of the alien's condition, in conformity with accepted local standards of medical practice.

This statement must also provide that the United States quarantine station at New York will be furnished a clinical evaluation of the alien, including necessary X-ray films, and a report of final disposal of the case. In each instance the statement of agreement regarding these services must specify the name and address of the hospital at which the services will be provided, and must stipulate that the alien will

be given care on an inpatient or outpatient basis when necessary after his arrival at the hospital.

In applying for his immigrant visa the alien must also submit:

- An affidavit from a sponsor or other responsible individual that financial arrangements for the alien's care have been made with the hospital, unless the Dependents Medical Care Act applies.
- Assurance that upon admission into the United States he will go direct to the specified hospital; submit to such examinations, treatment, isolation, and medical regimen as may be required; and remain under the prescribed treatment or observation, whether on an inpatient or outpatient basis, until discharged.

- Assurance that he will comply with the provisions of *Sanitary Measures for Travel of Aliens With Tuberculosis*. This applies only if the alien's tuberculosis is considered to be in communicable form, in which case he is given a copy of the document.

For purposes of these requirements, the Public Health Service recognizes a hospital as "an institution for the treatment of tuberculosis" if it is listed in *Tuberculosis Beds in Hospitals and Sanatoria*, Public Health Service Publication No. 518. Copies of this have been sent to State health departments and other local health agencies.

Immigration and Public Health Service officials have expressed the hope that when health departments or qualified private institutions and physicians are called on to provide care for an alien with tuberculosis who is seeking admission to this country, they will carry out the letter of the regulations in order that the spirit of the law may be observed.

Health Needs and Opinions of Older Adults

LENA DICICCO, M.S.P.H., and DORRIAN APPLE, Ph.D.

TO LEARN something about how older people perceive their health needs and how they meet them, an interview survey was conducted among 95 elderly persons living in a low socioeconomic district of Boston, Mass. Although the findings may be characteristic to some extent of the socioeconomic level of the group, they are undoubtedly related in part to the respondents' age. In any event, the group is a sample of potential consumers of public health services. Their behavior, attitudes, and opinions should be of value to public health personnel planning or administering services for such a population.

The study, carried out in 1955, was designed specifically to investigate the following factors and their interrelations: state of health and health care, satisfaction with health, respondents' appraisal of health needs and care, and use of mass media for health information. With a few changes, a number of the questions in the interview schedule were taken from the much more extensive schedule used in the survey in the Kips Bay-Yorkville Health District of New York City (1). Most of the interviewing was done by an interviewer with considerable training and experience on research proj-

ects of the Harvard University department of social relations. The remainder was done by DiCicco.

Characteristics of the Sample

A random sample of 158 persons 65 years of age and over was drawn from a single census tract within the Whittier Street (Roxbury) District of the Boston Health Department. According to the 1950 census, the total population of those ages in the census tract is 377. Median rental in the residential area is \$24 per month; about 35 percent of the housing is dilapidated or has no running water; less than 15 percent of the employed have "white collar" jobs or better; and more than half the population is nonwhite.

The sample yielded 95 interviews. Of the 63 nonrespondents, 26 were men and 37 women; 39 persons (16 men and 23 women) had moved, were deceased, or could not be found; 14 (9 men and 5 women) had working hours that prevented their being interviewed; and 1 man and 9 women refused to be or were incapable of being interviewed because of illness or a language handicap. The interviews averaged an hour in length. Only seven of the respondents showed any negative feelings about being interviewed.

Of the 95 respondents, 25 were between 65 and 69 years of age; 55 were in their seventies; and 15 were 80 or over. Twenty were white men, and 15 were Negro men; 40 were white women, and 20 were Negro women. Forty-four were born in the United States; of the foreign

Miss DiCicco, health educator, and Dr. Apple, sociologist, were members of the staff of the gerontology and chronic disease unit of the Harvard School of Public Health when the survey reported here was undertaken. Miss DiCicco is presently on the staff of the health division of United Community Services of Metropolitan Boston. Dr. Apple is with the Boston University School of Nursing.

born, 18 were born in Canada, 11 in Ireland, 7 in the British West Indies, and the remaining 15 in 13 other countries. The mean length of residence in this area of Boston was 40 years.

Twenty-nine of the respondents were married; 58 were widowed, divorced, or separated; and 8 were single. Besides the 29 married respondents, who were living with their spouses, 30 persons were living alone, 25 were living with relatives, and 11 were living with nonrelatives. Twenty-one reported owning their own homes, and 74 were tenants or lodgers. Fourteen persons had finished high school; 28 had attended high school; and 53 had not completed grammar school. Forty-six were Protestant; 40 were Roman Catholic; and 3 were members of other faiths; the others did not designate a religious affiliation. Eighteen had never worked; 14 were currently employed; and 63 had previously worked.

In summary, the sample included substantial numbers of whites and nonwhites, Roman Catholics and Protestants, native born and foreign born. The preponderance of women, the low educational level, the few still employed, and the small number living with spouses are characteristic of older persons. Their poverty and substandard housing are characteristic of the area in which they live.

The race and sex distributions of the sample were representative of the distributions of all persons aged 65 years and over in the census tract. The sample, however, tended to be older than the census tract population. Half of the 377 persons 65 years old and over in the census tract were in the 65-69 group, but only one-fourth of the sample were in this age category. The difference is probably due to the number of persons in the lower age group who were not interviewed because of their working hours.

State of Health and Health Care

The state of health of the respondent was determined through questions about the number of days spent in bed during the previous year, ailments or symptoms present at the time of the interview, and whether he was under treatment by a physician. Conditions were considered to be under treatment if medication prescribed by a physician was being taken or if the

patient had been seen by a physician within the previous 6 months.

Only two-fifths of the sample reported having been in bed because of illness during the previous year. Thirty-three persons said they had been ill once, and 4 had had 2 illnesses each. These 37 persons reported a total of 696 days in bed.

Forty persons said they had an illness under treatment at the time of the interview; 28 reported an illness not under treatment; and 27 reported no illness.

As shown in table 1, of the 208 ailments reported by 68 individuals, heart and circulatory diseases, diseases of bones and joints, and hearing disorders are the three leading categories. These are chronic diseases for which medical science has little to offer in the way of cure. Practice and opinion of the group surveyed, as brought out in the data that follow, reflect a conviction that aches and pains and physical limitations are a part of old age and a general skepticism that anything can be done about them.

Index of Health

From several questions we constructed a single index of health that would distinguish the more healthy from the less healthy persons. With such an index, we could test whether the more healthy differed from the less healthy with regard to other data that we gathered from our sample.

The index we constructed is known as a Gutt-

Table 1. Ailments and symptoms reported by 68 individuals

Ailment or symptom	Number	Percent
Total-----	208	100.0
Heart and circulatory diseases-----	48	23.1
Diseases of bones and joints-----	34	16.3
Hearing disorders-----	26	12.5
Foot conditions-----	18	8.7
Gastrointestinal disorders-----	18	8.7
Nervous disorders-----	18	8.7
Kidney disorders-----	16	7.7
Vision disorders (including some in persons wearing glasses)-----	15	7.2
Diabetes-----	3	1.4
Respiratory diseases-----	3	1.4
Other-----	9	4.3

Study Advisers

Assistance in planning the study was provided by a Harvard School of Public Health Advisory Committee composed of Dr. Robert B. Reed, Dr. Beryl Roberts, Dr. Claire Ryder, and Dr. Leonid Snegireff, and Mrs. Marie F. Gately of the Boston Health Department. Dr. Reed, associate professor of biostatistics at the Harvard School of Public Health, helped in selecting the sample and setting up tables as well as with general advice.

The study was financed through grants from the W. K. Kellogg Foundation and the Proctor & Gamble Fund.

man scale. This method of combining replies to several questions into a single score for each person was developed during World War II by social scientists employed by the Army to study experiences and opinions of soldiers (2, 3). It has been used extensively in sociologic research and has a number of advantages over other methods of combining several items of information into a single score. (Every Guttman scale reported in this paper has a coefficient of reproducibility of more than 0.90.)

For example, suppose we have information about the presence or absence of three traits, A, B, and C, in a sample of people. Suppose that these three traits are all indicators of a single underlying characteristic, such as healthiness, and that trait A occurs most frequently, trait B the next most frequently, and trait C the least frequently. If we find that persons who possess only one of the traits possess A, while those who possess two of them possess A and B, then the items form a Guttman scale. We have in our sample only four types of persons: those who have none of the traits, those who have A only, those who have A and B, and those who have all three. This staircase arrangement means that we can conclude that each type possesses a greater degree of the single characteristic underlying the traits than does the type preceding.

Item A in our index of health was based on replies to the question about number of days in bed. Item B was based on an index of satisfaction with health constructed from replies to

five questions: How would you say your health is now? Do you think your health is better or worse than that of other people your age? Is your health better or worse or about the same as it was 10 years ago? Does it keep you from doing things? Does it keep you from seeing people? Item C was based on responses to the question of whether the person was having any present trouble with his health.

Using this scale, we were able to distinguish four types of persons ranging from the most healthy to the least healthy.

As a test of validity, our state of health scale was cross-tabulated with the interviewer's rating of respondents on Zeman's rating scale of activity (4). Zeman's ratings are: (a) capable of unlimited and unsupervised activity; (b) capable of moderate activity in the neighborhood but perhaps requiring assistance for extended or tiring trips; (c) activities limited, needs supervision and assistance a good part of the time, is practically housebound, needs transportation for trips to doctor or clinic; (d) confined to bed or immediate vicinity; (e) totally blind or so self-limited that self-care is not possible. The correlation was 0.59, which is adequate evidence of the validity of our scale. (This and all other correlations were calculated by the formula for the phi coefficient, with both variables dichotomized as close to the median as possible. For this sample, a phi coefficient of correlation greater than 0.21 is large enough to be statistically significant at the .05 level.)

Health Care

We were interested in finding out whether persons who rated low on the state of health scale reported receiving more or less health care than those who rated high. To answer this question we constructed a Guttman scale of health care received. Item A was based on the question of whether the person has a physician or hospital to which he usually goes. Item B was based on replies to this question: Some people think it's a good idea to see a doctor for a regular checkup ever so often even when they aren't sick, while other people think there's no use seeing a doctor unless you have something wrong; what do you think? Item C was based on whether the person said he had

seen a physician for any purpose in the previous year.

We computed a phi coefficient of correlation between health status and health care using types as defined in the state of health scale and in the health care received scale. The two had a correlation of -0.24 , which means that there is a moderate but significant tendency for people who are healthy to stay away from health care (according to their report of their activities) and for the less healthy to receive more health care.

Characteristics of the Two Groups

We were also interested in what differences there were within the "healthy" and the "unhealthy" groups between those who received much health care and those who received little. By thus holding constant the effect of health, we hoped to find indications of the reasons that some persons received more health care than others.

Within each of the two groups, we investigated the relationship between health care and age, sex, race, marital status, native or foreign birth, education, economic level, and whether the person lived alone or not. Within the healthy group, a clear difference emerged in regard to place of birth, marital status, and economic level. (Our criteria for higher, versus lower, economic level were: respondent owns his own home or he is working or chief wage earner of the household is working.) All persons who were native born, married, and economically better off than their neighbors reported a low level of health care. As we proceed to those possessing any two of these characteristics, to those possessing any one of them, and finally to those who are foreign born, non-married, and of a low economic status, the proportion with a high level of health care steadily increases. The difference is great enough for the chi-square test to reject the null hypothesis at the .01 level.

The same relationship between health care and place of birth, marital status, and economic level tended to appear among the less healthy, though the relationship in this group is not great enough to permit rejection of the null hypothesis.

These data indicate that it is likely that hos-

pitals and physicians do not see a representative cross section of the population of older persons whom we studied. Therefore, health services for older people planned on the basis of knowledge of the needs, wishes, and life circumstances of patients may not be acceptable to those who are not seeking health care.

The apparent relation between the amount of health care and the three characteristics might be interpreted this way: All three characteristics have to do with social affiliation. The foreign born have disrupted their early ties by emigrating. Married people have a social tie which the widowed, divorced, and single do not have. Our measure of economic level is home ownership or employment, both of which are social ties. Since receiving health care provides an opportunity for association with other people, it may be that a desire for contact with other persons and a felt lack of social ties lead the foreign born, the nonmarried, and those with a lower economic status to obtain health care. Further research would be needed to test this interpretation. If it were found to be correct, then this motivation for seeking health care might provide a means to increase the utilization of health services by at least a part of the population of older people.

Satisfaction With Health

We hypothesized that a major variable in our sample's evaluation of their health was the degree of activity which a respondent felt he could sustain. Evidence to confirm this hypothesis was found in three ways.

First, interviewer ratings on Zeman's scale of activity had a correlation of 0.54 with our five-item index of satisfaction with health, previously described. This is a highly significant degree of correlation.

Second, the index of satisfaction with health had a correlation of 0.44 with a Guttman scale of respondent's reported activity. The activity scale was constructed from answers to four questions. These concerned (a) visits (sometimes or often) with relatives or friends, either in the respondent's home or elsewhere; (b) walks or rides (sometimes or often); (c) a trip "to town" in the past 6 months, and (d) church attendance (at least once a week).

Finally, a content analysis of statements made by respondents when they were asked how their health compared with that of others their age disclosed that one theme appeared much more frequently than any other. This was the theme of ability to get around, to get out, to do what one has to do. As one lady put it (age forgotten): "He gives me health and strength to get my work done. My 'tired' makes me fall down at night, but then I'm all right for the morning." And one 74-year-old man: "My health is better than some who are 25 or 30. I carry a big buffing machine up and down stairs all by myself."

On the basis of this evidence, we accept the hypothesis that, for a majority of these people, to be active is to be healthy. We may speculate that being active allows older persons to satisfy their need for independence and thus to live up to society's requirements. In this group, health seems to be important only as it affects an individual's capacity to carry on activities important to him.

These findings raise serious questions about the kind of health education that would be meaningful in getting this group under medical care, let alone preventive care. They often consider themselves well despite ailments so long as they can meet the requirements of everyday living.

Respondents' Appraisal

A person's ideas on what constitutes good health and good medical care are important in how well he maintains his health. A number of questions in the interview supply information on how these older people view their health needs and the care they receive.

Periodic Medical Examinations

Respondents were asked when they had last had a "regular, thorough checkup." Fifty-six reported having undergone such an examination within the previous 2 years, but further questioning revealed that only 19 persons, or one-third, had visited a doctor specifically for a checkup. The remaining 37, or two-thirds, explained that the "checkup" was given them when they went for treatment of a disorder.

Thirty-three persons, more than half of the

56, reported that their physical examination had been performed by a private physician.

As a rough measure of the scope of the examination given, information was sought as to how many of the examinations included a chest X-ray, a blood test of some sort, and a urine test. Only 20 persons had had all three and 10 had had none, as shown in the tabulation below. These findings indicate that the examination given most of these people was not a "thorough checkup," although they do not show anything about the adequacy of the examination with regard to the particular disorder under treatment.

<i>Number of tests</i>	<i>Number tested</i>	<i>Percent tested</i>
3-----	20	35.7
2-----	12	21.4
1-----	14	25.0
0-----	10	17.9
Total-----	56	100.0

All 56 respondents who said they had undergone a physical examination expressed satisfaction with the adequacy of the examination.

These facts point to a general misconception in this group as to what constitutes a "regular, thorough checkup," as this would be defined professionally. By the respondents' standards, any contact with a physician, regardless of how the physician might define the purpose of the visit, was apparently a "thorough checkup." It would be valuable to know whether this group is typical of the general population in its apparent lack of knowledge of diagnostic tools.

To obtain further data on attitudes about the value of preventive health services the sample were asked to agree or disagree with two statements: "I think it is a good idea to have a checkup ever so often even though I'm not sick." "Doctors are good people to keep away from when you're feeling well."

About half of the sample agreed with the first statement, but only one-third of the sample disagreed with the second.

In judging the responses to these questions, the consistency in the respondents' answers is important. About 78 percent of the group originally rejecting the idea of preventive care repeated their views when asked the second question. Of the 50 persons who, in answering the first question, professed belief in the idea of

a checkup even though not sick, only 50 percent were consistent in their answers to the second question. Even more significant is the small number of persons, only 19, who acted on their belief that a preventive physical examination is a good thing.

Some of the negative comments on the subject of preventive care include: "Why go to a doctor when you can always tell when you're getting sick." "Some older people are always running to doctors because they have nothing better to do, and are making themselves sick." "I don't want to worry till I have to." "If you go, he's got to find something wrong with you; it's his business."

The idea that you know when you are sick made some sense 50 years ago when a large proportion of the prevalent illnesses were infectious and were accompanied by symptoms that the layman could recognize as signs of illness. The idea seems particularly inappropriate, however, for an age group prone to chronic diseases, the onset of which may be slow and inconspicuous. It would be interesting to see to what extent these ideas are shared by younger adults who have grown familiar with the preventive aspects of pediatric care, for instance.

As long as people go on measuring health in terms of their ability to eat and sleep or keep going, they will reject the idea that a physical examination is necessary to determine health status.

Preventive Clinic Facilities

In contrast to a majority of the group's negative feelings about the value of a physical examination, about two-thirds stated that they thought older persons would use a special neighborhood clinic where they could get advice and a checkup free of charge. An opinion on this subject was sought in an effort to gain some inkling as to whether this group would use such a service if one should ever be made available.

This generally favorable reaction deserves close scrutiny. It is easy and costs nothing to say yes to an abstract question like this one concerning use of a nonexistent facility for which there will be no direct consumer cost. Also, this same group held few opinions on medical facilities with which they had not had

direct experience. Since the only clinic in the Boston area like the one described was not known to any of the respondents, it is difficult to regard these assets as anything but superficial. Expressed beliefs and practices of this group as revealed elsewhere in the study do not reflect a "felt need" for preventive medical services, however much we would like to think so.

Physicians

Fifty-three respondents said they had a private physician who usually took care of them. How had they selected him? Thirty-eight of them, about three-fourths, said he had been recommended by relatives or friends. Four had heard of him through a social worker, and 11 by various other means.

Respondents' standards for evaluating a physician were elicited by asking how a person can tell whether he can trust a doctor. As this question was added to the interview schedule after some interviews had been completed, we have replies from only 79 persons. One theme in the replies had to do with the doctor's technical competence: "You can tell by his background," or "His treatment works." Another theme had to do with appreciation of the doctor's personal qualities: "I like the kind of person he is," or "I like the way he does things." Table 2 summarizes the data.

Men and women differed significantly in their responses to this question ($\chi^2=8.3$; $P < .02$). Men emphasized the more practical-sounding "satisfaction with treatment"; with women, the doctor's personality seemed to count most. Also, of 15 persons who said they trusted a physician because he was recommended by others (included in the category labeled "other"), 13 were women.

Only two persons named valid criteria for trusting a physician: one, the doctor's background; the other, his staff position in a hospital. The apparent lack of knowledge in this area is not surprising; knowing how to judge a physician presupposes a sophistication about medical matters not usually acquired except through special education or sustained contact with the medical world.

For the same reason, the patient's ability to evaluate his physician's treatment is to be ques-

Table 2. Reasons given by 79 respondents for satisfaction with specific physician

Reason	Male		Female		Total	
	Number	Percent	Number	Percent	Number	Percent
Technical competence	12	52.2	11	19.6	23	29.1
Personal qualities	6	26.1	25	44.6	31	39.2
Other	5	21.7	20	35.7	25	31.6
Total	23	100.0	56	99.9	79	99.9

tioned. As one person put it in stating his disadvantageous position: "If you're a patient, you have to trust a doctor."

The patient's need to personalize this dependent relationship with his doctor is captured in one woman's statement: "I must like him because the doctor will help me if I have confidence in him and if I trust his judgment."

This need to like the doctor as a person is difficult to fulfill within the framework of an overcrowded clinic where many older persons receive care and where treatment is not necessarily always by the same physician. If rewards in the way of treatment are scanty for this age group, how much more is there need for allowing this doctor-patient relationship to develop within the clinic setting!

In general, attitudes toward doctors were strongly positive. Eighty percent disagreed with the negative stereotype, "Doctors aren't really interested in what happens to you," and 73.6 percent denied that "doctors tend to treat younger people better than older people." Also, there were defending statements such as these: "If some old people don't get good service, it's their own fault because they're so cranky and critical." "They're so overcrowded, they do the best they can with what they have."

Medical Facilities

Respondents were asked to name medical facilities they had actually used among the six major hospitals in the Boston area, the city health department, the visiting nurse association, and nursing homes.

Fifteen persons stated that they had never used a hospital service, but the remaining 80 had had 144 hospital admissions. Opinions about 112, or four-fifths of the 144 admissions,

were frankly favorable. Ten persons had had experience with the visiting nurse association and three with the health department, each of whom expressed a favorable opinion of the facility. Respondents were also asked to give opinions on hospitals whose services they had never used, but most of them hesitated to comment without direct experience.

Knowledge and discrimination about medical care and public health facilities are not widespread. This is not surprising since most people are not interested in services until they need them. When they do, there is no readily accessible body of knowledge which could help them in making a wise choice of facilities; and even if there were, according to the data given here and elsewhere, their choice would probably still be based on recommendations of family and friends.

Perhaps the question of sponsorship of a special preventive clinic might be raised here. The desirability of a health department's undertaking this service should be explored carefully, with at least this observation in mind: Most of the group of older people in this study had never used any of the health department services, according to their statements on the subject. Moreover, the disadvantages of separating preventive and curative aspects of child care, for example, are becoming increasingly apparent. Planning of services for older people might well be done with an eye toward integration with facilities and services already known and used by this age group. Integration of a preventive service with other services is particularly important when the need for such a service is commonly unrecognized. Consideration should be given to any practice, no matter how administratively unorthodox, that would en-

hance the possibility of the services being understood and used.

Mass Media for Education

Since so much effort has been directed toward acquainting the public, chiefly through mass media, with some of the basic facts about tuberculosis, cancer, and diabetes, we asked our sample some questions to test their information about these diseases. More than two-thirds of the sample answered questions on tuberculosis and cancer correctly (table 3). Agreement with the statement that cancer can be cured was often qualified by a doubting tone or with an additional "so they say" or "they say it can." Perhaps information campaigns are allowing the public to make the correct responses while still clinging to old beliefs.

Only about half of the persons interviewed agreed that people with diabetes can lead a useful life, with 33 unable to give an answer. Although the prevalence of diabetes makes it seem likely that everyone is acquainted with the disease, the sizable number of "I don't know's" might reflect the feeling that one can't really judge what it's like for someone else to have the disease.

Questions were asked as to whether the respondent read articles about health in the newspaper or magazines or listened to health programs on the radio or television. There was no significant difference in information about diseases between those who use such media for health information and those who do not.

Of the 86 persons who can read newspapers, 52, or almost two-thirds, said that they read articles on health. However, very few could name columns that they read regularly. Of

the 88 persons who have a radio or television set, only 34, or approximately two-fifths, said that they listen to programs on health. Common replies were: "I don't know why I don't," and "I'm just not interested."

Sex, race, or satisfaction with health status produced no significant differences in responses to these questions.

The picture is quite clear here that, although many people might feel that the aged ought to be interested in knowing more about health and illness, the people themselves probably wish just the opposite, that is, to escape the infirmities coupled with the aging process.

Summary and Conclusions

An interview survey of 95 persons aged 65 years and over who reside in a low socioeconomic district in Boston, Mass., has produced some observations that may be of value to public health personnel in planning and administering services for a similar population.

The most common perception of health among this group was in terms of activity. Health was important only as it became poor health and interfered with daily activity and maintenance of independence.

Since perception of health is an important determinant of one's beliefs and practices in the areas of medical and preventive care, the implications of this perception are significant. It makes for difficulty in motivating such people to seek medical care for the many ailments that are not severely handicapping. And, as borne out by opinions and practices discovered in this survey, it makes even more difficult attempts to make preventive services meaningful.

Among the study group, there seemed to be

Table 3. Public information about tuberculosis, cancer, and diabetes

Statement	Agreed		Disagreed		No answer		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
People can have tuberculosis and not know it	71	74.7	11	11.6	13	13.7	95	100.0
Cancer, if it is found early, can be cured	68	71.6	12	12.6	15	15.8	95	100.0
People with diabetes can lead a useful life	55	57.9	8	8.4	32	33.7	95	100.0

little appreciation of the newer diagnostic and therapeutic tools, and objective criteria for selecting and judging the quality of medical care received were almost completely lacking. Selection and evaluation of physicians and facilities were made almost completely on the basis of personal experience and opinion of family and friends.

There was little expressed need for preventive services, and for the most part these people had already-established patterns for using medical facilities, based chiefly on personal contacts.

These findings suggest that preventive services for older people probably should be approached from the point of view of integration with services that they consider well established. The services might be paid for by health departments but administered within hospital outpatient departments or departments of welfare.

The frequently mentioned "look at the whole man" is especially important when that man is part of our aging population. The things that give life meaning for him greatly influence the narrow sphere of activities which can be described as health behavior. Sound public health planning cannot be accomplished in a vacuum.

In some communities, public health responsibility might mean taking the initiative to get community concentration on the problem. In those where the framework for action already exists, responsibility might consist of taking

an objective look at all medical and public health services as they affect the elderly, putting new emphasis on already existing programs, and creating new services within whatever agency seems to offer the best chance of being used by the consumer in question.

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DOCUMENTATION NOTE

Tables presenting the data for the scales, correlations, and statistical tests described in this report have been deposited as document No. 5596 with the American Documentation Institute Auxiliary Publications Project, Photoduplication Service, Library of Congress, Washington 25, D. C. Photocopies may be obtained by remitting \$1.25; a 35-mm. microfilm copy by remitting \$1.25. Advance payment is required. Cite document number. Make check or money orders payable to Chief, Photoduplicating Service, Library of Congress.

Migratory Labor Notes Resumed

On April 1, 1958, the Department of Labor resumed publication of *Migratory Labor Notes*, a bulletin describing public and private activities affecting migrant agricultural workers and their families. Issued by the President's Committee on Migratory Labor, the organ first appeared May 11, 1955, and then, reflecting the small number of State migratory labor committees at that time, appeared only intermittently thereafter, once in November 1955 and again in May 1956. Publication on a more frequent basis was stimulated by the growing number of State migratory labor committees, which now total 17, and by the requests of many State and community organizations.

Whether to use septic tank systems to provide needed sewage disposal facilities is an increasingly critical question facing the ever-expanding suburbs.

The Septic Tank System in Suburbia

JAMES B. COULTER, B.S., M.S.

THE WIDESPREAD use of the septic tank has come as a result of an unprecedented demand for housing in suburban areas. Before attempting an evaluation of the septic tank as a means of sewage disposal, it is well to review the factors promoting its use. Since the septic tank is intimately connected with the house-building industry, the review must consider that industry and the forces governing its activities.

After a long freeze during the war, construction got under way in the late 1940's with a mass movement of people to the suburbs of population centers. It seemed reasonable at that time to believe that this shift in population resulted from the wartime backlog of housing demand, that eventually construction would catch up with demand leaving relatively stable communities with new outer boundaries, and that permanent facilities could then be installed to replace the temporary devices used during the expansion period.

It now appears that this reasoning was in error. The tremendous increase in the birth rate following the war was contrary to all predictions. In 1940, the consensus was that the population of the United States had become relatively stationary and perhaps would even

begin to decline. Even as late as 1946 a population of 153 million was forecast for 1960, and an ultimate peak of 164.5 million was predicted for 1990. The great increases in marriages and births following the war made these predictions appear ridiculous. The present population is more than 171 million, and an estimate of 180 million now seems logical for 1960. In fact, during the past 10 years population increase has consistently exceeded the estimates.

The number of immediate housing starts is more nearly associated with new family formation than with population increase. The formation of new families is sagging at present. One reason may be that people of marriageable age are now being drawn from the low birth rate years of the depression, but the high birth rate after the war should bring a population wave in the marriageable age commencing in the late 1960's. Even now we are watching a wave of children pass through grade school. In a few years they will be in high school, later in college, and then they will marry and become prospective home owners.

Family income is another factor that greatly influences house building and home ownership. In spite of increases in the cost of housing, rising family income has brought home ownership within the reach of a large portion of the Nation. The percentage of owner-occupied dwellings rose from 43.6 percent in 1940 to 55 percent in 1950, and a further increase to 60 percent is predicted for 1960 (1). There is also

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good reason to believe that a rising family income, coupled with modern financing, will lower the age at which first homes are bought.

Suburban Expansion

Considering these facts, housing starts are expected to continue at the present rate of approximately 1 million a year for the next 4 years. Subsequently, the number of starts should steadily increase to a possible 2 million or more a year in the 1970's.

The location of new housing in relation to the central city is extremely important to any consideration of the septic tank's place in fringe area sanitation. Since 1950, practically all of the population increase has been registered in the 172 standard metropolitan areas, but the largest gains have been made on the fringes of the parent cities. This trend is expected to continue (2). To be realistic, we must conclude that the limits of the parent cities are virtually fixed by a number of factors, including the will of the people. Building sites within the corporate limits served by a sewerage system are already scarce and are priced out of the speculative house-building market. Therefore, the vast majority of new houses will be built in the suburbs at an ever-increasing distance from the parent city.

Because of these circumstances, the highway-building program may have more impact on housing location than any other factor in history. Approximately \$40 billion of the estimated \$100 billion to be spent on modern roads in the next decade will be spent in metropolitan areas. As a result, expressways of limited access will lead from the countryside into the heart of all major cities. Since time and not distance is the major consideration of commuters, the expressways will make land, considerably distant from the city, available and attractive for housing. Clearing rights of way during the construction of the highways will generate more pressure for the suburban movement. One noted economist estimated that from 300,000 to 400,000 houses a year demolished in the highway and urban renewal programs will have to be replaced and relocated. Although the estimate appears high, the demolition of houses is undeniably another factor in forcing people to the suburbs.

With the highways will come restaurants, motels, shopping centers, and other service installations. Industries will also locate along the highways, creating still further pressure for fringe area housing. All of these buildings, requiring sewerage and other community facilities, will intensify sanitation needs.

An appraisal of these facts and trends leads to a sobering conclusion. The expansion of standard metropolitan areas is not a passing phase. Rather, we have seen the start of a trend that may continue into the 1980's.

We are entirely unprepared to provide adequate sanitary facilities of all types in a dispersed community of the proportions visualized. The problem of sewage disposal is already acute. In fact, to dispose of sewage properly in an expanding suburban area from the time the first house is occupied until the area is fully developed is perhaps the most complex problem ever faced by the sanitary engineering profession.

Other disciplines are also concerned, but the basic responsibility for supplying essential sanitary facilities is vested in the sanitary engineer. Unless he seizes the initiative and becomes a strong leader, the situation will continue to deteriorate and confusion will increase.

Uses and Drawbacks of the Septic Tank

The problem of sewerage facilities for the rapidly developing, dispersed urban complex springing up around the population centers has no universally acceptable solution. The usefulness and the limitations of each method must be reviewed according to specific circumstances, and the method that can be financed and that shows the greatest promise as a permanent solution should be selected. There is danger in advocating one solution to the exclusion of all others. Conversely no usable solution should be discarded on the basis of experience arising from abuse or improper use of that solution.

The septic tank system, a term I am using to mean the method of on-lot disposal by soil absorption, can be satisfactory for individual homes in a developing suburban area. However, its use must be governed by a number of stringent conditions to avoid extremely unsatisfactory results. When properly used, the system has these advantages:

1. Sewage treatment is complete; the effluent is disposed of on each lot, and each home owner is responsible for his own system.

2. The method is compatible with both the pattern of construction in the United States and the requirements of health authorities.

3. Sufficient capacity to serve each home in a development is added as the house is built.

In general, the usefulness of the septic tank system decreases as the volume of sewage from the individual establishment to be served increases. This limitation is serious when schools, shopping centers, industries, and other larger installations are contemplated for the same general area as the housing. Even though septic tanks may be satisfactory for the individual houses, their use may thwart the construction of a unified sewerage system capable of serving the larger establishments.

The septic tank should never be used where conditions are improper for successful operation. Although frequently used as a temporary measure, the septic tank is actually a poor interim device. Septic tanks have often been permitted in soil where there was little, if any, chance for successful operation, on the assumption that adequate sewerage service would be provided as soon as the population density reached the point where it was practical. Theoretically the temporary use of septic tanks may appear attractive, but practical considerations work against the plan. Some of these considerations are:

1. Immediate failures create nuisances and public health hazards.

2. Many home owners, fearing the effect on property values, refuse to admit that failures are occurring, and do not support remedial action by a community.

3. Not all systems fail at the same time, and home owners who are not having trouble, or who have recently spent sizable sums to repair their systems, are reluctant to agree to community action.

4. There will always be resistance to bond issues and higher taxes. The expense and inconvenience of tearing up streets and lawns to install a community system stymies action until the need is critical.

5. The expense of installing a collection system in an established neighborhood is several

times the cost of the same system in raw land.

Other methods of interim treatment to protect public health should be devised so that the collection system is installed when the houses are constructed, thus eliminating the inconvenience and double expense.

Conditions for Satisfactory Use

A septic tank can be used satisfactorily under certain conditions. These conditions have been reported in a number of technical publications and described in detail in the *Manual of Septic Tank Practice* (3). If recommendations for sewage systems were based on these conditions, the septic tank system would be rejected where it will not work, and complaints stemming from malfunctioning systems would be tremendously reduced. Almost equally important, a system installed under proper conditions which later fails due to misuse, lack of maintenance, or old age can be corrected at the home owner's expense.

Control by a strong, well-organized health department and a sound ordinance are essential to prevent abuses of this system. A good ordinance defines the soil conditions suitable for septic tanks, requires enough usable area on each lot for two complete disposal fields, empowers the proper authority to establish minimum requirements for both septic tank and disposal field, and requires an approved permit before construction starts, individual design and construction by competent, responsible, authorized parties, and a final inspection of the system before it is covered.

The regulation should set forth the soil prerequisites for use of a septic tank system. A reliable percolation test is time consuming and requires great attention to detail. Some health departments feel that the evaluation of land is not a government function but part of the engineering services to be borne by the developer. For this reason, a number of county departments require that every application for a septic tank permit be accompanied by a log of the subsoil and results of percolation tests performed under the direction of a licensed professional engineer or another equally responsible person.

The regulation should also specify the mini-

mum available area that must be provided on each lot for the disposal field. Generally, this is a better practice than specifying lot size; the shape of the lot, the location of the house and driveways, and undesirable terrain features often make it difficult, even on large lots, to find a suitable location for the absorption field. The areas reserved for the system should be large enough to replace the disposal field completely, if necessary.

At the county level, authority to issue septic tank permits is vested in the health department or the building department, but invariably complaints are handled by the health department. Where dual authority and responsibility exist, cooperation between the two departments is essential so that no permit is issued unless the soil conditions are satisfactory and the system is designed in accordance with the regulation.

Inspection is necessary to see that the system was constructed in accordance with the permit and that good construction practice was used. A builder has sometimes been required to remove tile and rock and rework trenches to remove smeared and sealed surfaces. It is necessary also to check the provisions for storm water runoff, the house sewer for stoppages, the tank inlet for clearance, and the distribution box for level, as well as the capacity and construction details of tank and disposal field. Most counties prefer to have their own man make the inspection. The system should be covered as soon as the inspection is completed to protect it from rain and accidental damage.

Important Factors

Soil is the most important natural factor, and the only uncontrollable one, governing the successful use of the septic tank system. To be useful for subsurface disposal of sewage from a large number of homes, an area must have at least 4 feet of cover between the bottom of the disposal field and rock or other restraining formation; the ground water table must be at least 4 feet below the surface of the ground; and the soil must have an acceptable, sustained percolation rate.

For isolated dwellings it may be possible to shade some of these requirements, but for subdivisions all of them must be met. Unfor-

tunately, more than half of the soil in the United States is unsuitable. Furthermore, unsuitable soil is likely to be found on high ground desirable for house building, while suitable soil is likely to be in the bottom land desirable for agriculture. Because no practical method of improving soil for this purpose has been found, the wise builder has learned to make a preliminary investigation before purchasing a tract of land for housing development.

Design starts with the capacity of the system. As water consumption and modern appliances have increased, the concept of increased tank capacity has been readily accepted. Surprisingly, there is resistance, or at least apathy, to enlarging the absorption area even though it is the absorption field that ultimately disposes of the daily volume of liquid.

The relationship between soil area and life of the system is difficult to convey, but it exists nevertheless. Each year an increment of the available absorption area is exhausted and becomes useless for leaching. When the remaining area no longer absorbs the daily volume of liquid the system fails. A 3-bedroom modern house requires approximately 1,000 square feet of design area in a 60-minute soil. Few existing recommendations of local health departments meet that standard. Location, layout, grade, and details of construction are also essential to good design, and for the most part are adequately covered in present recommendations.

Careful construction is as important as good soil. Good construction cannot improve the soil, but good soil can be ruined by poor construction. Within my experience, most early failures of well-designed systems in good soil can be traced to improper construction. Perhaps the worst offense is working the soil when it is too wet. Surfaces are smeared and effectively sealed before any sewage is applied to the system. Walking or working on the absorption surface will compact and seal it prematurely. Raking the sides and bottom of the trench after the soil is relatively dry, and removing all loose raking before the gravel is laid in the trench is strongly recommended.

Another common fault is to set the distribution box so that most of the liquid goes to one trench. This practice is especially serious and

always leads to failure on sloping ground where the overloaded trench can be relieved only through surface seepage. Occasionally, the box is set correctly and later disturbed by a truck or other piece of heavy equipment running over it.

Open trenches are seldom protected from rainstorms, and surface water loaded with silt is permitted to run into them. Another fault is to permit roof drainage to run over the ground above the disposal field. Wet weather failures can often be traced to this cause. An assortment of articles including tools, rags, lunches, and gloves have been left in house sewers. A frequent mistake is to set the septic tank backwards. The inlet baffle is sometimes broken off, or only a narrow crack is left for sewage to pass through when the house sewer is pushed too far into the tank. The list of construction deficiencies can run into a full scale treatise, but fortunately, installation techniques have improved tremendously in the past few years and are continuing to improve.

Proper use of the system is essential to long and trouble-free operation. Even with good soil, correct design, and proper construction, the home owner can misuse his system and cause it to fail. Using water wastefully or adding appliances can overload the system. Maintenance is simple but essential for a long period of efficient performance. The tank should be inspected annually and cleaned before sludge reaches the level where it is carried to the disposal field and damages the soil. On a lot of sufficient size with the septic tank located properly, failures due to abuse of the system can be corrected by installing a new disposal field. This is of course expensive, and when the home owner is informed of the dangers of abuse and the expense of installing a new disposal field, he is usually very cooperative about proper maintenance of the system.

Summary

The population of the United States is increasing at a rate far in excess of that predicted as late as 1946. Substantially all of the in-

crease is being absorbed in the fringes of the standard metropolitan areas. The growth and decentralization of metropolitan areas is not a passing phase, but rather a major population trend that will continue for many years. The construction of new housing in undeveloped areas creates a problem of sewage disposal of a complexity and magnitude never before faced by the sanitary engineering profession.

The change in community development from the tightly knit parent city of 20 years ago to the sprawling urban complex of today calls for reorientation of plans, philosophy, and techniques if costly errors are to be avoided. The usefulness and limitations of each method of sewage disposal should be reviewed in the light of specific circumstances, and the method that can be financed and that shows the greatest promise as a permanent solution should be selected.

The septic tank system can be a satisfactory means for disposal of sewage from individual houses in a developing suburban area, but its use is subject to a number of stringent conditions if extremely unsatisfactory results are to be avoided. The septic tank is a poor temporary measure, and it should never be used when conditions prohibit its successful operation. In general, the usefulness of the septic tank system decreases as the size of the individual establishment it is to serve increases.

The essential conditions for the satisfactory use of the septic tank system are effective regulation and control, suitable soil, and proper design, construction, and use. Sufficient area should be provided on each lot for replacing the absorption system in case of failure.

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Without additional personnel or funds and without appreciably affecting the amount of time spent on other duties, a county health department has established and is now expanding a home safety program based on daily reporting of accident hazards by its field staff.

Growth of an Accident Prevention Program

THOMAS H. GRAY, M.S.P.H., and GEORGE V. TRUSS

AFTER 2 years of studying and experimenting with integration of home accident prevention activities into the routine duties of the department's field staff, the Jefferson County (Ala.) Department of Health has developed a home safety program that is showing definite signs of progress and merit.

Like many other health departments, the Jefferson County agency for many years has recognized and expressed concern about the problem of accidents. Ever since reliable records have been available in Jefferson County, accidents have appeared among the leading causes of death. Safety has been taught by the public health nurses since the beginning of maternal and child health programs. Accident prevention has been a side result of the general sanitation program, although the activities have not been specifically directed toward that goal. Because of insufficient funds, lack of personnel, and a heavy schedule of other duties, no attempt was made to give special emphasis to accident prevention until 1954.

In 1954 the health department decided to remove accident prevention from the realm of thought and discussion and to develop specific plans for active work in home safety. This decision was made without the prospect of ad-

ditional funds or personnel. In fact, the department was seeking some type of program that could be carried out without much added cost.

Advances in the control of the acute communicable diseases and improvement in maternal and infant mortality rates indicated that greater returns from the field staff's time might be realized if safety instruction were made a part of the home visits. Hospitalization and emergency treatment of patients injured in accidents were increasing an already heavy economic burden of medical care for the community's needy. Discontinuance of the local chapter of the National Safety Council also added impetus to the establishment of a health department accident prevention program. Furthermore, the fact that accidents ranked fifth among the leading causes of death in the county during 1954 definitely pointed to the need for such a program. As shown in table 1, home accidents accounted for more than one-third of all accidental deaths in Jefferson County during the 5-year period 1952-56.

As a first step in creating a plan of action against home accidents, a home accident prevention committee was formed within the health department. The committee was composed of the health officer and the directors of the bureaus of public health nursing, communicable disease, sanitation, vital statistics, and health education. Conferences were subsequently held by the committee with home acci-

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Table 1. Number of deaths by accident class, Jefferson County, Ala., 1952-56

Accident class	1952	1953	1954	1955	1956	5-year total	
						Number	Percent
Occupational	36	27	29	38	28	158	11.7
Home	105	83	93	104	77	462	34.3
Motor vehicle	108	106	107	108	119	548	40.7
Other public	44	35	25	24	51	179	13.3
Total	293	251	254	274	275	1,347	100.0

dent prevention specialists of the Public Health Service to obtain advice and guidance in establishing a local program.

Familiar questions arose in meetings of the home accident prevention committee. Where do most accidents occur? How do they happen? Who gets hurt? What is the extent of the problem? What seasonal hazards should be given emphasis?

Morbidity Surveys

To try to answer these questions and to provide data about the nature and extent of non-fatal home accidents in the county two surveys were made in 1954, one in March and the other in June. In addition to collecting data, the surveys were conducted as a means of stimulating interest in home safety among the staff and to provide discussion material for inservice education. The surveys were made also with the idea that the data might be helpful in establishing a baseline for use in measuring indications of progress made in reducing home accidents.

During the survey months every public health nurse, sanitary inspector, and communicable disease officer carried a supply of mimeographed questionnaires. In each home visited they asked whether an accident which disabled the victim for 1 day or more had occurred in the previous month to any member of the household. For each such accident the questionnaire was completed. In every home visited, the name, age, and sex of all household members were recorded to provide a population basis for the study.

It was not considered practicable to visit homes for the sole purpose of making inquiries

regarding home accidents. Generally, therefore, the survey was restricted to the homes that the field staff visited while carrying out their regular duties.

The surveys provided information regarding the accident experience of nearly 48,000 persons living in 10,294 homes. Since the families interviewed included only those visited by the staff in connection with routine health department activities and therefore were not necessarily a representative sample of the county's population, caution was observed in interpreting the results.

The March survey revealed 103 nonfatal home accidents among 24,191 persons. On an annual basis, this means a rate of 55.4 per 1,000 survey population. The 85 home accidents recorded in the June survey gives an annual rate of 42.5 per 1,000 survey population. Falls (39 percent), cutting or piercing injuries (22 percent), and burns (20 percent) were the three principal causes of the accidents, accounting for four-fifths of the injuries reported in the two surveys. Sixty-eight percent, or 128, of the 188 accidents reported in the surveys were in persons under 15 years of age. Only six accidents occurred to individuals 65 years old or over.

No morbidity surveys have been made in Jefferson County since 1954, but the department's accident prevention committee has been considering conducting one in the near future.

Accident Hazard Reporting

Armed with the information from the survey about the principal causes of accidents and about age and sex differentials, and with a more enlightened staff, the health department began

considering ways to attack the problem of home accidents.

We decided that a daily report on accident hazards observed in each home visited would be the most productive and most practical method of integrating accident prevention into the routine activities of the field personnel. Accident prevention efforts would thus admittedly be limited to that segment of the population visited by the health department personnel for other purposes, but we believed that the procedure would nevertheless serve two important purposes: First, the requirement of a report every day would keep each employee safety conscious and constantly aware of the home accident problem. Second, analysis of the data reported would provide statistical information for evaluation and planning of other measures. Moreover, this type of activity could be carried out without additional staff or travel expense.

A special form for reporting home accident hazards was prepared. On it the public health nurses, the sanitary inspectors, and the communicable disease officers were expected to enter each day the number of hazards observed, the number called to the householder's attention, and the number corrected or eliminated, along with a brief description of the hazard. Also required was the number of persons given in-

struction in home safety. The form, shown below, has been in continuous use since March 1, 1955.

The health department's bureau of vital statistics prepared summaries of the hazards reported during the 10-month period of 1955 and during 1956. Copies of the summaries were distributed to all employees so that they might see and study as a whole the accident problem in the homes visited by the field staff.

The number of home accident hazards observed and the number known to have been eliminated are as follows:

	<i>Observed</i>	<i>Eliminated</i>
1955 (March-December) -----	6,623	1,825
1956 -----	9,874	2,290
Total-----	16,497	4,115

During this period the field staff gave person-to-person home safety instruction to 21,147 individuals. Generally this instruction related to a specific hazard in the home at the time of the visit.

The hazards observed can be classified as:

1. Structural deficiencies potentially dangerous as direct or contributing causes of falls and fire burns. These included defective flues and electric wiring, defective steps, and holes in floor.

2. Poor housekeeping, as revealed by yards

Home Accident Prevention Supplemental Daily Report

Description*	Number of home accident hazards		
	Observed	Called to attention of householder	Eliminated

*List hazards, such as unprotected open grate, improper storage of medicine or matches, unanchored rugs, broken glass in yard, unlighted basement steps, etc.

Number of persons given home accident instruction-----

Signed-----

Date-----

Title-----

cluttered with broken glass, nails, and other debris, accumulation of papers and other inflammable materials, and floors littered with objects that might cause falls.

3. Lack of supervision of infants and young children, and of the aged, particularly the physically and mentally handicapped.

4. Unsafe practices of adults, such as smoking in bed, using chairs or boxes instead of stepladder, and starting fires with kerosene.

5. Indifference and neglect on the part of householders in providing a safe environment in and around the home.

The address of the home visited was not indicated on the field report, but a great many of the homes listed as having structural hazards were known to be occupied by persons of low economic status. In view of this situation, the number of structural hazards reported as eliminated was encouraging.

The reports provided strong evidence that parents in many homes failed to supervise the activities of children and to give proper care and attention to infants.

Discussion of the hazards with the householders frequently indicated that they were aware of the deficiencies but that they had neglected to take corrective action. Neglectfulness most often prevailed in homes of the lower income group, who were financially unable to provide proper safeguards. This fact pointed to the need for encouraging householders to improvise with scrap lumber and other available materials such things as fireplace screens and porch and step railings.

The hazards found during 1956 ran the whole gamut of accident-producing situations. The principal hazards, according to the kind of injury likely to result, are listed in the accompanying tabulation, with the total number in each main category and of each type (in parentheses) eliminated.

Hazards were recorded as eliminated if corrections were made during the field worker's visit or if observed to have been corrected on a subsequent routine visit. Except for certain major hazards, visits were not made specifically to determine whether or not recommendations for eliminating hazards were carried out. It is therefore not possible to assess the program in terms of the proportion of hazards actually

Number of Hazards Eliminated

Falls	569
	Defective steps or porches (260); no handrails or balustrades for porches or steps (21); unanchored throw rugs (16); inadequate light in hall or stairs (10); toys, playthings, other objects on floor or walkways (213); miscellaneous (49).
Burns	313
	Unprotected open fireplaces, space heaters (47); inflammable objects too close to heating equipment (13); child playing with matches (38); improper disposition of lighted cigarettes (19); unsafe storage of matches (61); hot liquids in reach of children (54); miscellaneous (81).
Poisoning	179
	Improper storage of medicine (104); of poisons and household chemicals (48); of fuel oil (26); miscellaneous (1).
Electric shock	17
	Defective wiring, worn cords, improper installation of electric wiring, unsafe use of appliances (17).
Drowning	3
	Uncovered wells or cisterns, unprotected fish pool, child playing in tub unattended (3).
Cuts, lacerations	704
	Broken glass, tin cans in yard, boards with protruding nails (364); child playing with knives, scissors, other cutting instruments (184); sharp objects in reach of children (41); miscellaneous (115).
Firearms	6
	Firearms in reach of children (6).
Suffocation	63
	Abandoned refrigerator with latch unremoved (11); infant sleeping with parent (40); too much cover on infant (12).
Strangulation	55
	Baby nursing from propped bottle (55).
Ingestion of foreign body	77
	Child with pennies, marbles, or other objects in mouth (77).
Miscellaneous and unclassified	304
Total	2,290

eliminated. It is reasonable to assume that many more unsafe practices have been corrected and dangerous environmental conditions removed as a result of the safety instruction given than the figures in this paper would indicate.

Neither is it possible to determine the number of injuries prevented and the number of lives saved, but the fact that a substantial number of accident hazards are being removed from Jefferson County homes each month is an indication of the program's value.

Many of the hazards reported as corrected were relatively unimportant and at the worse might have resulted only in minor cuts, lacerations, or injuries of slight severity. However, a number of death-producing hazards, such as abandoned ice boxes, uncovered wells, and improper storage of medicine, poisons, and household chemicals, were also recorded as eliminated.

Program Expansion

The department's accident prevention activities were expanded considerably in 1957. Safety education was accelerated through the use of newspapers, radio, and television. Contacts with various community organizations began to pay dividends as evidenced by an increased interest in home safety and mobilization of efforts to reduce the number of home accidents. The Jefferson County Medical Society, the hospitals in the county, and the health department together formulated plans for an active poison control information center and emergency treatment stations. The fire department and the gas and electric companies agreed to provide inspection services for homes upon the request of the health department.

The accident hazard detection program was extended to meat markets, restaurants, grocery stores, and other food-handling establishments visited by sanitary inspectors. Correction of many unsafe conditions and practices in these places, such as improper use of sterilizers and use of broken ladders in storerooms, were recorded during the first 6 months of 1957. It is also noteworthy that one of the sanitary inspectors was instrumental in having a new fire escape installed at a local maternity hospital.

Perhaps the greatest contribution to the accident prevention movement during 1957 was the adoption of a housing code by the city of Birmingham. The new code provides for the immediate correction of existing hazardous conditions as well as for minimum standards for health and safety in all new construction.

Safety features included in the housing code relate to provision of unobstructed and minimum head room for doorways leading outside, installation of railings on unenclosed structures over 3½ feet from the ground, and provision of guard railings on steps containing five risers or more. The new code also states that windows used for ventilation shall have screens; hallways and stairways shall be adequately lighted; and porches and steps shall be so constructed that they will support the normal load expected.

The Birmingham City Commission named the Jefferson County Health Department as the agency for administering the new code and provided a supplemental appropriation for employing additional personnel to carry out its provisions.

Since the adoption of the code, space has been provided on the accident hazard report form for recording addresses where major or special hazards exist, and more intensive followup of the conditions is planned. Significant hazardous conditions are referred to the bureau of communicable disease control for followup and correction. The responsibility was given these staff members because less time is now required for communicable disease control work.

Inservice Training

Training of staff personnel has been carried on in small groups periodically. It has been designed not only to impart information, but to maintain interest in the program. Safety check sheets have been given to staff members for a safety evaluation of their own homes. Group discussions about hazards found during visits and of the accident hazard summaries prepared by the bureau of vital statistics have taken place.

During the training sessions it has been emphasized that changing attitudes and behavior is even more important than eliminating the hazards. The hazards found in homes merely help to create interest in home accidents and to

Table 2. Home accident fatalities, Jefferson County, Ala., 1925-56

Years	Number of deaths	Rate per 100,000 population
1925-29 ¹	109	27.3
1930-34 ¹	81	18.5
1935-39 ¹	96	21.3
1940-44 ¹	89	18.5
1945-49 ¹	95	18.0
1950-54 ¹	94	16.2
1955	104	17.0
1956	77	12.4

¹ Average for the 5 years.

provide a learning situation. No matter how many hazards are discovered and recorded as eliminated, accidents will continue until individuals accept the need for making their homes hazard-free and until they begin to practice safe ways of doing things.

Preliminary Evaluation

The forms for reporting accident hazards have served the useful purpose of creating an awareness among the staff of the numerous and complex problems associated with home accidents. In addition they have provided an index of the staff's ability to integrate home safety with their routine duties.

Both the number of home accident fatalities and the death rate for home accidents in the county show a decreasing trend over the past years, as revealed in table 2.

This decline is not assumed to be due alone to the activities of the department, for there have been other agencies, organizations, and groups active in promoting home safety. It is believed, however, that during the period March 1955 to December 1956, the staff's contact with 21,147 individuals in the county, the elimination of at least 4,115 hazards, and the effort to encourage practice of safety has contributed to the downward trend in the lives lost through home accidents.

The amount of staff time devoted to home accident prevention activities in a year's period is estimated to be equal to the time of three full-time employees. The department's home accident prevention committee feels, however, that three full-time persons could not possibly give the wide coverage offered by the entire field staff, or receive the same acceptance in the homes.

The department's home accident prevention program is still largely in the developmental stage, but it represents a serious approach to the problem. In the future, accident prevention activities will have an increasingly prominent place in the plans and objectives of the department.

Physician Visits During Summer of 1957

The American people visited their physicians during the months of July, August, and September 1957 at a rate of almost five times a year, according to data gathered through household interviews by the U. S. National Health Survey, Public Health Service.

The Survey report, entitled "Preliminary Report on Volume of Physician Visits, United States, July-September 1957" (see announcement on p. 568), points out that although the interviews occurred at a time of the year when people are least likely to call the doctor, respiratory diseases were probably at above-average levels.

Persons living on farms used physicians' services at a rate of 3.6 visits a year, compared with 4.5 for the rural nonfarm population and 5.1 for the urban population. Nine out of ten of the visits were in the physicians' offices.

Mass Therapy in Attempted Control of Amebiasis in a Mental Institution

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DEMONSTRATION of 25 laboratory proved cases of clinical amebiasis in an Iowa State institution for the feeble-minded initiated a cooperative control program. An epidemiological investigation, including examination of stool specimens, revealed that 64 percent of the males and 34.4 percent of the females in two buildings occupied by the more retarded patients were infected with *Entamoeba histolytica*. Experience with clinical cases had shown that the problem was not limited to any one building or area of the institution and, because of the poor personal hygiene of many of the patients, it was not believed that recommended methods of improving sanitation would stop the transmission of intestinal pathogens. It was therefore decided to attempt to control the situation through mass therapy of all the institution's residents.

The Institution

The institution, a hospital and school, is situated on 1,000 acres of land 40 miles north of Des Moines, Iowa. It has dormitories for patients, school buildings, a home for employees, and an administration building with separate hospital wards for men and women and dental, X-ray, and modern medical laboratories. Auxiliary buildings house the power plant, water filtration system, dairy, and farm equipment. Patients reside in sturdily constructed 2-or 3-story brick dormitories, which are well separated on beauti-

fully landscaped grounds. Inside, the buildings are well kept, despite overcrowding at times. Each dormitory has its own kitchen, operated by an employed cook and supervised by the dietitian. Most buildings have a dining room on each floor.

In 1951-53, the period of the study, there were approximately 1,600 feeble-minded and epileptic patients in the institution, ranging in age from 1 month to 80 years. Men and women patients were approximately equal in number. The 262 employees included 22 professional individuals, among them 9 physicians, 6 registered nurses, and a dietitian, and 105 supervisors or attendants in the dormitory buildings. Patients helped in such activities as serving food, washing dishes, feeding bedridden patients, cleaning floors, and changing beds.

Patients in a given dormitory were somewhat comparable mentally and physically. The pop-

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ulation composition of the eight dormitories was:

Type of patient	Buildings	
	Male patients	Female patients
Laundry, dairy, and garment workers.	Birches	Larches
School children	Hemlock	Westwood
Delinquent and low grade	Oak Hall	Maple Lodge
Low grade	Pinehurst	Elm Crest

Although the personal hygiene of patients in Birches and Larches Buildings was almost equal to that of normal individuals, the personal hygiene of those in Pinehurst and Elm Crest Buildings was very poor. Fecal incontinence was common with 67 percent of the males in Pinehurst and 49 percent of the females in Elm Crest. These patients soiled their beds and clothing with urine or feces, or both. Some were not averse to coprophagy. The personal hygiene of the patients in Oak Hall and Maple Lodge was not much better, but the hygiene of those in Hemlock and Westwood compared favorably with that of the patients in Birches and Larches. Larches was recognized as the "best building" in every respect.

A trial of mass therapy was planned in Pinehurst, the building with the known highest prevalence of *E. histolytica*. Oxytetracycline was selected for use in view of the report by Tobie and co-workers (1) of the virtual elimination of *E. histolytica* in a similar institution at Wassaic, N. Y., by mass therapy with this antibiotic. Two preliminary trials of mass therapy in Pinehurst Building, with 6-month followup, failed to confirm Tobie's work. Therefore, in extending mass therapy to the entire institution, it was decided to administer more than 1 drug at 6-month intervals on 2 occasions. Although the primary objective of the investigation was control of amebiasis, an effort was made to obtain information on the comparative effectiveness of the drugs employed.

Realizing that opportunities for reinfection probably varied from building to building, drugs were randomly assigned to the patients in 4 of the 8 buildings. These patients, constituting the principal study group, were examined to determine both the results of control measures and the relative effectiveness of the drugs. In the other four buildings, a single

drug was used to treat all patients in a building, and patients were examined to determine the degree of control obtained by mass therapy.

Drugs

Three standard amebicidal drugs were given, singly or in combination of two of the three (2,3). These were oxytetracycline, carbarsone, iodochlorhydroxyquin, or oxytetracycline and carbarsone combined. The dosages were in accordance with the recommendations of Dr. Harry Most of New York University, Communicable Disease Center consultant.

The four therapeutic regimens were administered according to the weights of the patients (table 1). Two formulations of oxytetracycline were used. During the first treatment period in Pinehurst, the 250-mg. capsules were found to be too large for many of the younger patients to swallow, and it was sometimes necessary to mix the contents of the capsules with water. Therefore, oral drops of oxytetracycline were provided for the younger patients and others having difficulty in swallowing. The carbarsone and iodochlorhydroxyquin capsules were swallowed without difficulty. All medication was followed by a glass of water or fruit juice and by examination of the mouths of the patients to make certain that the drugs had been swallowed.

During preliminary trials of mass therapy in Pinehurst, one-half of the daily dosage was

Table 1. Dosages of four amebicidal drug regimens

Drug	Weight of patients (pounds)	Dosage
Oxytetracycline	≥ 70	2 gm. per day for 10 days.
	<70	1 gm. per day for 10 days.
Oxytetracycline and carbarsone	≥ 70	2 gm. oxytetracycline per day for 5 days.
	<70	1 gm. carbarsone per day for 10 days.
Carbarsone	≥ 70	1 gm. oxytetracycline per day for 5 days.
	<70	0.5 gm. carbarsone per day for 10 days.
Iodochlorhydroxyquin	≥ 70	1 gm. per day for 10 days.
	<70	0.5 gm. per day for 10 days

given in the morning and the other half in the afternoon. During mass therapy of the entire institution, the daily dosages had to be administered at one time, usually in the morning. A record clerk was always present to record the amount of medication received. Although a physician or a registered nurse was also present, supervisors and attendants often administered the drugs since they knew the idiosyncrasies of the patients and were best able to gain their cooperation.

Before instituting mass therapy in a building, the physician in charge checked the medication for each patient and made any necessary changes. Usually, recommended dosages (table 1) were given the older patients and those in good physical condition, but for very young or debilitated patients, dosages were reduced according to body weight.

When more than one drug was given, the physician changed the randomly assigned drug for persons for whom he considered its use contraindicated. At least once a day during the treatment period, the records of each patient were examined and he was seen by the attending physician. If intolerance to the medication was observed, therapy was changed or withdrawn. However, this was done for less than 3 percent of the patients, none of whom had been selected for examination.

Employees were encouraged to participate in the amebiasis control program by taking one of the medications. If they preferred, they could submit three specimens to the hospital laboratory for examination and, if the specimen was found to be positive for *E. histolytica*, they could be treated by their private physicians.

Collecting and Examining Specimens

Identical methods of collecting and examining fecal specimens were used throughout the study. In order to insure correct identification, specimens were collected in the presence of the ward supervisor or attendant and were brought immediately to a technician stationed in the building. The technician knew the building from which the specimens originated but did not know the drug regimen received. One portion of each specimen was preserved in 5

percent formalin and another in PVA fixative (4), and both portions were forwarded to the parasitology laboratories of the Communicable Disease Center, Chamblee, Ga.

The portions of feces preserved in formalin were concentrated by the formalin-ether sedimentation technique (5). Heidenhain iron-hematoxylin-stained films were prepared from the portions of feces preserved in PVA fixative and were examined with 50 \times and 95 \times oil immersion objectives. Unstained and iodine-stained wet mounts prepared from the concentrate sediments and Heidenhain iron-hematoxylin-stained films were examined for a minimum of 15 minutes each.

Preliminary Trials

Because of the results of Tobie's study (1), it was planned to evaluate the effectiveness of mass therapy through observation of the patients in Pinehurst Building during a 12-month post-treatment period. However, since the infection in Pinehurst was returning to a high level at the end of 3 months, the patients were re-treated 6 months after the first medication. During the first course of therapy, the antibiotic was given in 250-mg. capsules; during the second course, in oral drops. On each occasion, all patients, supervisors, and attendants received a 10-day course of the drug, the dosage depending on the weight and general condition of the patient.

During the 6 months following therapy, new admissions to Pinehurst were kept at a minimum. Any persons who had to be placed in the building were started on a 10-day course of medication 3 days before they were admitted. Also, during this period, the physician in charge was asked to withhold amebicidal drugs from all persons except those with active clinical amebiasis.

In order to evaluate the effectiveness of mass therapy, 125 patients were randomly selected for examination prior to therapy and again 1 month, 3 months, and 6 months after therapy was started. At each examination only 1 specimen was collected from each patient.

Of these 125 patients, 101 submitted specimens at each collection period during the 12 months of the two therapeutic trials. Intesti-

nal parasites were found in 93 of 101 patients, as follows:

<i>Entamoeba histolytica</i> -----	64
<i>Entamoeba coli</i> -----	75
<i>Endolimax nana</i> -----	63
<i>Iodamoeba buetschlii</i> -----	26
<i>Dientamoeba fragilis</i> -----	3
<i>Giardia lamblia</i> -----	11
<i>Chilomastix mesnili</i> -----	19
<i>E. histolytica</i> , <i>E. coli</i> , or <i>E. nana</i> ¹ -----	90

¹ Amebic prevalence rate (6).

For possible future comparison with other studies, there are included in the preceding tabulation and in table 3 figures for amebic prevalence (6). In determining this prevalence rate, a person infected with *E. histolytica*, *Entamoeba coli*, or *Endolimax nana* is counted as a single positive individual. Figure 1 shows the individual prevalence rates of these parasites at each examination.

Prior to the first mass therapy with oxytetracycline capsules, 64 percent of the patients in Pinehurst were positive for *E. histolytica*; 1 month after the beginning of therapy, 4 percent were positive; 3 months after, 18 percent; and 6 months after, 33 percent.

The week following the 6-month collection of specimens, the second mass therapy with oxytetracycline (oral drops) was administered. One month later, the prevalence of *E. histolytica* was reduced to 5 percent but, again, by the end of the 6-month post-treatment period, the rate had risen to approximately one-half of the pretreatment prevalence rate, or 19 percent. The graphs for the prevalence rates of *E. coli* and *E. nana* are similar to that for *E. histolytica*. However, by the end of only 3 months after each medication, the prevalence rates for these two amebae had almost regained the pretreatment levels.

Mass therapy with oxytetracycline had a marked effect upon *Iodamoeba buetschlii*, but apparently none on *Chilomastix mesnili* and *Giardia lamblia*. Prior to the first course of therapy, 26 of the 101 patients who submitted specimens were infected with *I. buetschlii*; 1 month and 3 months after treatment with oxytetracycline, 2 infections were found but none was observed at the next 4 examinations (9 months). The infections with *Dientamoeba fragilis* were too few for consideration.

Table 2. Results of mass therapy with oxytetracycline in Pinehurst Building

Organism	Response in known positives			
	Number positive pretreatment ¹	Percent negative post-treatment		
		1 month later	6 months later	
<i>Entamoeba histolytica</i> -----	97	94.8	70.1	
<i>Entamoeba coli</i> -----	151	63.6	15.9	
<i>Endolimax nana</i> -----	130	49.2	26.9	

¹ Sum of positives prior to first and second preliminary trials of mass therapy.

Table 2 presents the observed effectiveness of mass therapy in individuals known to be positive for *E. histolytica* prior to two courses of therapy. Of the 97 patients known to be infected, 94.8 percent were "negative" 1 month later, and 70.1 percent were "negative" 6 months later. The effectiveness of therapy on *E. coli* and *E. nana* was significantly poorer, particularly at the end of 6 months.

Mass Therapy

In extending mass therapy to the entire institution, the 4 drug regimens were administered on 2 occasions 6 months apart. The second time, each patient received a different drug regimen from that he had received previously. The preliminary trials in Pinehurst had indicated that the effectiveness of mass therapy in controlling amebiasis might be determined by examining specimens collected 6 months after therapy. Therefore, specimens were examined the week prior to the first therapy, 6 months after the first therapy and just prior to the second therapy, and 6 months after the second therapy. At each examination, a single specimen was collected from as many as possible of the individuals who had been selected for examination.

Table 3 records the intestinal parasites found in the randomly selected patients in the eight dormitory buildings prior to mass therapy throughout the institution. The prevalence rate for *E. histolytica* ranged from 7 percent in Larches to 46 percent in Oak Hall. At the time

of this examination, Pinehurst residents had already received two courses of therapy. The initial rate for this parasite in Pinehurst had been approximately 64 percent (fig. 1).

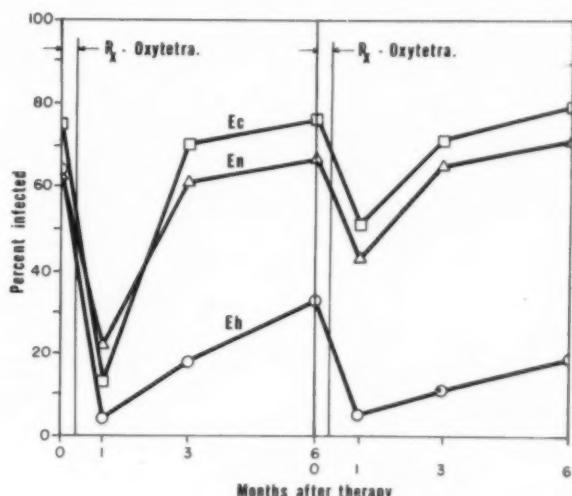
During the 12 months following the first course of therapy in the entire institution, all new admissions received the combination therapy of oxytetracycline and carbarsone for 3 days preceding admission to a dormitory.

Although control of amebiasis was the primary objective of the study, an attempt was made to obtain information on the relative effectiveness of the four drug regimens. Preliminary surveys had demonstrated that the prevalence of intestinal amebae varied from building to building in almost direct relationship to the general level of personal hygiene of the patients. Therefore, the dormitories were divided into 2 groups of 4 multiple-therapy buildings and 4 single-therapy buildings.

Multiple-Therapy Buildings

Because the general type of patients varied from building to building, the influence of re-infection on drug evaluation was equalized by randomly assigning all 4 therapeutic regimens to the patients in 4 of the 8 buildings. Birches,

Figure 1. Results of two preliminary trials of mass therapy with oxytetracycline in one building of a mental institution. Incidence of *Entamoeba histolytica*, *Entamoeba coli*, and *Endolimax nana* prior to medication and during the 6-month post-treatment period.



Hemlock, Larches, and Westwood dormitories, which housed the higher grade patients, were selected since it was thought that reinfection would be reduced to a minimum in these buildings. Each time mass therapy was given, all

Table 3. Prevalence of intestinal parasites in a mental institution prior to mass therapy, by building

Observations	Four drug regimens				Single drug regimen				
	Larches (female)	West-wood (female)	Hemlock (male)	Birches (male)	Maple Lodge (female)	Elm Crest (female)	Oak Hall (male)	Pinehurst (male)	Total
Number patients	187	267	168	247	159	179	202	207	1,616
Number examined	117	116	119	118	50	47	50	50	667
Percent positive	62.4	87.9	70.6	77.1	70.0	74.5	72.0	82.0	74.5
Percent									
Organisms identified									
<i>Entamoeba histolytica</i>	6.8	49.1	23.5	27.1	24.0	29.8	46.0	34.0	28.6
<i>Entamoeba coli</i>	47.0	54.3	45.4	54.2	50.0	40.4	52.0	78.0	51.7
<i>Endolimax nana</i>	12.0	44.8	36.1	32.2	32.0	46.8	18.0	46.0	32.5
<i>Iodamoeba buetschlii</i>	2.6	4.3	10.1	5.9	2.0	0.0	18.0	0.0	5.5
<i>Dientamoeba fragilis</i>	12.0	9.5	12.6	8.5	2.0	0.0	4.0	10.0	8.7
<i>Giardia lamblia</i>	0.0	19.2	14.3	11.0	6.0	8.5	2.0	18.0	10.3
<i>Chilomastix mesnili</i>	14.5	11.2	13.4	7.6	10.0	12.8	12.0	24.0	12.6
<i>E. histolytica</i> , <i>E. coli</i> , <i>E. nana</i> ³	53.8	80.2	62.2	67.8	62.0	63.8	70.0	80.0	66.9

¹ Patients in Pinehurst had been treated twice previously.

² Rate preceding preliminary trials, 64 percent.

³ Amebic prevalence rate (6).

four drug regimens were employed in each building. For the second course of therapy, each patient received a different drug, according to the following schedule:

First course	Second course
Oxytetracycline-----	Carbarsone
Oxytetracycline-----	Iodochlorhydroxy-
and carbarsone.	quin
Carbarsone-----	Oxytetracycline and
	carbarsone
Iodochlorhy-	Oxytetracycline
droxyquin.	

To evaluate the control program within each building, approximately 30 individuals on each of the drug regimens were randomly selected for examination, or a total of approximately 120 persons on each regimen. In all, over one-half of the 869 individuals in the four buildings were selected.

Single-Therapy Buildings

In Elm Crest, Maple Lodge, Oak Hall, and Pinehurst Buildings, which housed the lower grade patients, a single drug regimen was administered at each of the two mass therapy periods. The drugs were changed in each building on the second occasion. To appraise the effectiveness of control of amebiasis, 50 individuals in each building, or approximately 200 of the 747 persons in the 4 buildings, were randomly selected to submit specimens during the 3 designated periods.

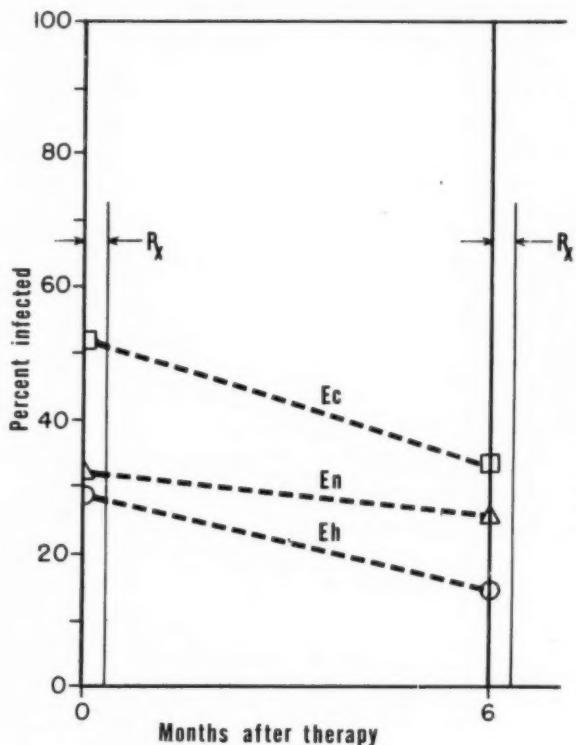
Results of Mass Therapy

The results of treatment with 4 drug regimens and with 1 drug regimen are given below.

Four Drug Regimens

Oxytetracycline, carbarsone, iodochlorhydroxyquin, and oxytetracycline and carbarsone combined were given to the patients in Larches, Westwood, Hemlock, and Birches Buildings on two occasions. Figure 2 shows the prevalence rates of *E. histolytica*, *E. coli*, and *E. nana* prior to the first course of therapy and 6 months later, based on the examination of 502 and 468 individuals, respectively. Dash lines are used in figures 2 and 3 since the lines do not indicate actual prevalence trends during the 6 months between examinations. From the experience in Pinehurst Building, it is reasonable

Figure 2. Results of mass therapy with four drug regimens in four buildings of a mental institution. Incidence of *Entamoeba histolytica*, *Entamoeba coli*, and *Endolimax nana* prior to medication and 6 months afterward.



to assume that an immediate decided drop in the prevalence of amebiasis after therapy was followed by a rise.

Prior to the first administration of the drugs, the average prevalence rate of *E. histolytica* in the four buildings was 28.8 percent (fig. 2). Six months later it was 14.4 percent. The prevalence of *E. coli* was also reduced significantly, but not the prevalence of *E. nana*. *I. buetschlii* was practically eliminated, being reduced from 5.7 percent to 0.5 percent; *G. lamblia* and *C. mesnili* were reduced slightly; and the rate for *D. fragilis* remained unchanged. Six months after therapy no infections of *E. histolytica* were found in the patients examined from Larches and the lower floors of Hemlock and Birches Buildings.

After the 6-month post-treatment examination, all patients were re-treated with another drug regimen. Six months later, because of pressure of other work, stool specimens were collected only from the problem areas revealed

by earlier examination. These included all floors of Westwood and the upper floors of Hemlock and Birches. No specimens were collected from Larches. Hence, it is not possible to extend the graph in figure 2 to indicate the prevalence rates at the second 6-month post-treatment period.

The relative effectiveness of mass therapy in these buildings is demonstrated in table 4. Since there were no significant differences between the response to the first and second administrations of mass therapy, the results are combined. Therapy was significantly more effective in Larches and in Hemlock than in the other 2 buildings for practically all species except *I. buetschlii*, which was apparently eliminated in all 4 buildings. All known infections of *E. histolytica* in Larches were "negative" 6 months after the first therapy.

In table 5 are recorded the results of the individual drug regimens in reducing known infections regardless of location. In only one instance, oxytetracycline against *D. fragilis*, was one drug observed to be significantly more effective than the others. Mass therapy, regardless of the drugs administered, was more effective against certain species than against

others. For example, therapy was significantly better against *E. histolytica* (62.5 percent "negative"), than against *E. coli* (50.8 percent) and *E. nana* (48.8 percent), while all known infections of *I. buetschlii* were apparently eliminated by therapy. The results of therapy in the individual buildings are based on too small a sample for analysis.

Single Drug Regimens

A single drug regimen was administered to the patients in Maple Lodge, Elm Crest, Oak Hall, and Pinehurst Buildings on each of the two occasions of mass therapy. Figure 3 presents the prevalence rates of *E. histolytica*, *E. coli*, and *E. nana* in approximately 50 randomly selected patients in each building before and 6 months after each course of therapy. At the end of 12 months a significant reduction in the prevalence of *E. histolytica* was observed in Oak Hall and Elm Crest Buildings, with possible elimination of the parasite in Maple Lodge. An increase in prevalence apparently occurred in Pinehurst during the same period.

In Maple Lodge, prior to therapy with the combination of oxytetracycline and carbarsone, the prevalence rate of *E. histolytica* was 24 per-

Table 4. Results of two courses of mass therapy with four drug regimens randomly administered to all patients in Birches, Hemlock, Larches, and Westwood Buildings

Organism	Response in known positives ¹							
	Birches		Hemlock		Larches ²		Westwood	
	Number positive, pre-treatment	Percent negative, post-treatment ³	Number positive, pre-treatment	Percent negative, post-treatment ³	Number positive, pre-treatment	Percent negative, post-treatment ³	Number positive, pre-treatment	Percent negative, post-treatment ³
Total protozoa-----	237	54.0	217	69.1	108	79.6	405	48.9
Amebae-----								
<i>Entamoeba histolytica</i> -----	207	52.2	177	69.5	92	81.5	344	46.8
<i>E. coli</i> -----	45	73.3	29	93.1	7	100.0	95	45.3
<i>Endolimax nana</i> -----	87	34.5	72	63.5	53	84.9	117	40.2
<i>Iodamoeba buetschlii</i> -----	53	49.1	49	55.1	16	62.5	95	43.2
<i>Dientamoeba fragilis</i> -----	7	100.0	12	100.0	2	100.0	6	100.0
Flagellates-----								
<i>Giardia lamblia</i> -----	30	66.7	40	67.5	16	68.8	61	60.7
<i>Chilomastix mesnili</i> -----	16	53.3	21	66.7	0	-----	39	56.4
	14	78.6	19	68.4	16	68.8	22	68.2

¹ Sum of positives prior to first and second mass therapy.

² Therapy administered on only one occasion.

³ 6 months following treatment.

cent. Six months later, just before mass therapy with iodochlorhydroxyquin, it was zero. No *E. histolytica* infections were found 6 months after the second course of therapy but the prevalence rates of *E. coli* and *E. nana* were slightly higher than the reduced rates which were found 6 months after the first course of treatment.

In Oak Hall, prior to therapy with oxytetracycline, the prevalence rate of *E. histolytica* was 46 percent. Six months later, immediately preceding therapy with carbarsone, it was 12 percent, and 6 months after the second course it

was slightly higher. The responses of *E. coli* and *E. nana* were similar, although *E. nana* seemed to be affected more by carbarsone than were the other parasites.

In Elm Crest Building, prior to therapy with iodochlorhydroxyquin, the prevalence rate of *E. histolytica* was 29.8 percent; 6 months later, just before therapy with oxytetracycline, it was 22 percent; and 6 months after the second course of treatment the rate was 16.7 percent. The prevalence of *E. nana* was practically the same at each examination while that of *E. coli* was higher 6 months after the first therapy and

Figure 3. Results of mass therapy with single drug regimens in four separate buildings of a mental institution. Incidence of *Entamoeba histolytica*, *Entamoeba coli*, and *Endolimax nana* prior to medication on two occasions and 6 months afterward.

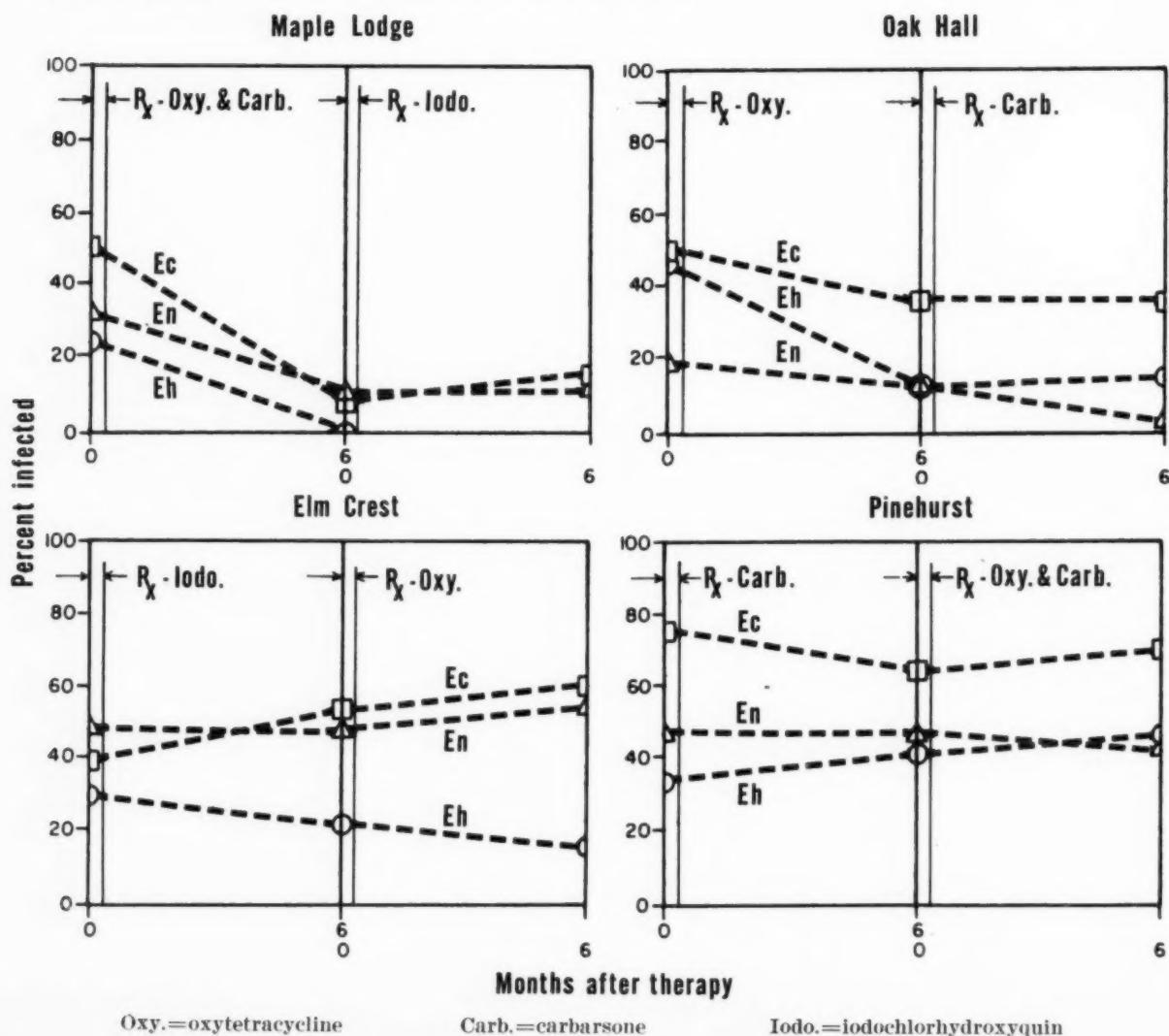


Table 5. Results of mass therapy with four drug regimens randomly administered to all patients in Birches, Hemlock, Larches, and Westwood Buildings

Organism	Response to drug regimen in known positives ¹									
	Oxytetracycline		Oxytetracycline and carbarsone		Carbarsone		Iodochlorhydroxyquir		Total	
	Number positive, pre-treatment	Percent negative, post-treatment ²	Number positive, pre-treatment	Percent negative, post-treatment ²	Number positive, pre-treatment	Percent negative, post-treatment ²	Number positive, pre-treatment	Percent negative, post-treatment ²	Number positive, pre-treatment	Percent negative, post-treatment ²
Total protozoa-----	237	54.0	239	62.3	258	63.2	233	52.4	967	58.1
Amebae-----	207	53.1	199	61.8	213	60.0	201	52.7	820	57.0
<i>Entamoeba histolytica</i> -----	44	59.1	44	65.9	51	60.8	37	64.9	176	62.5
<i>Entamoeba coli</i> -----	74	40.5	80	56.3	89	55.1	86	50.0	329	50.8
<i>Endolimax nana</i> -----	62	45.2	50	56.0	46	58.7	55	38.2	213	48.8
<i>Iodamoeba butschlii</i> -----	7	100.0	6	100.0	8	100.0	6	100.0	27	100.0
<i>Dientamoeba fragilis</i> -----	20	95.0	19	78.9	19	68.4	17	70.6	75	78.6
Flagellates-----	30	60.0	40	65.0	45	77.7	32	50.0	147	64.6
<i>Giardia lamblia</i> -----	14	50.0	19	63.2	25	72.0	18	44.4	76	59.2
<i>Chilomastix mesnili</i> -----	16	68.8	21	66.7	20	85.0	14	57.1	71	70.4

¹ Sum of positives prior to first and second therapy.

² 6 months following treatment.

practically unchanged 6 months after the second.

In Pinehurst Building, prior to therapy with carbarsone, the prevalence rate of *E. histolytica* was 34 percent; 6 months later, before therapy with the combination of oxytetracycline and carbarsone, it was 41.1 percent. Six months after the second therapy, the prevalence rate was 46.3 percent. Mass therapy with either drug regimen appeared to have little or no effect on the prevalence of *E. nana* and *E. coli*.

Since the patients in the four buildings did not receive the same medication, the relative effectiveness of mass therapy cannot be compared according to the response in known positives as was done in the case of the buildings where identical medication with four drug regimens was given (table 4). Likewise, since the type of patients varied from building to building, it is not practical to compare the effectiveness of the individual drug regimens as was done in the other buildings (table 5).

Treatment of Employees

All save 18 of the 262 employees in the institution received amebicidal drugs during the

mass therapy program. The 105 employees working in the 8 dormitories generally received their medication along with the patients. Most of the 18 untreated individuals were in administrative or professional positions. Two *E. histolytica* positive employees in Elm Crest refused therapy. Prior to the mass therapy program the examination of a single stool specimen each from 128 employees revealed 3.9 percent positives for *E. histolytica*.

Toxicity of Drugs

Since only standard amebicides of known toxicity were used in this study, physicians and nurses were primarily concerned only with those side reactions which might endanger the patients or interfere with proper administration of the medication. Aversion to the oral drops of oxytetracycline was the most troublesome side reaction. Although the younger children liked the sweet, cherry flavor of the oral drops, a number of the older patients, particularly the teen-age girls, vomited immediately after the drug was administered. When the drug was given in capsules, the difficulty ended.

No serious cases of diarrhea, more than four bowel movements a day, developed either during or within a few days after medication. Also, no cases of pruritus were brought to the attention of the physicians and nurses; however, the patients in the institution are relatively insensitive to such conditions or else accept them as a matter of course.

A few minor rashes were observed in patients receiving oxytetracycline and carbarsone combined but the attending physicians questioned any connection between the rashes and the drugs. One serious rash developed in a patient receiving iodochlorhydroxyquin. Dizziness was reported by one individual on carbarsone.

Discussion

In 1951 Tobie and his co-workers (1) reported virtual elimination of *E. histolytica* infections from a building of Wassaic State School, an institution for mental defectives, by treating all patients with oxytetracycline. Therefore, in our study it was surprising to observe the prevalence rate of *E. histolytica* return to relatively high levels after the use of the same antibiotic in two preliminary trials of mass therapy in Pinehurst Building. In both institutions, a similar course of therapy was used and no new patients were admitted to the buildings during the post-treatment periods without first undergoing therapy.

One striking difference between the two studies which may have contributed to the diverse results was the pretreatment prevalence rates of *E. histolytica*. In Pinehurst Building, one stool examination revealed *E. histolytica* infections in 64 percent of the patients, while at Wassaic four stool examinations showed a prevalence rate of 49 percent. Since more examinations of the Pinehurst patients would undoubtedly have increased the percentage of positives, there was a decided difference in the prevalence rates of *E. histolytica* in the two populations. Inability to eradicate all infections apparently allowed a significant reservoir to remain to reinfect patients through poor personal hygiene.

When mass therapy was administered throughout the entire institution on two occa-

sions, at 6-month intervals, the prevalence rates of *E. histolytica* were significantly lower in 7 of the 8 buildings by the end of the year's study. The effectiveness of therapy varied from building to building and appeared to be related to the prevalence of *E. histolytica* and to the general type of patients residing in the buildings. At the post-treatment examinations, *E. histolytica* was no longer found in residents of the three buildings with the lowest pretreatment prevalence rates (Larches, Hemlock, and Maple Lodge). Two of these buildings were occupied by the higher type of patients. Little or no change was noted in Pinehurst Building, which had the highest prevalence of *E. histolytica* and the most retarded patients.

Although stool examinations were not performed until 6 months after the end of mass therapy of the entire institution, from results observed in preliminary trials in Pinehurst, it is probable that a number of *E. histolytica* infections remained in each building after therapy was completed. In view of the patients' poor personal hygiene the treatment failures probably served as sources of infection. In Elm Crest, two infected employees, one of whom was a cook, may have been another source of infection.

In addition to the human reservoirs, reinfection may have occurred from organisms in the environment. In the first trials in Pinehurst the prevalence of *E. coli* returned to a high level after therapy more rapidly than did the prevalence of *E. histolytica* (fig. 1). Since both organisms were at a low level 2 weeks after therapy, the more rapid rise in prevalence of *E. coli* may indicate that cysts of *E. coli* remained viable in the environment for longer periods than did cysts of *E. histolytica*. Laboratory experimentations (7) have shown that cysts of *E. coli* survive desiccation to a much greater degree than do cysts of *E. histolytica*.

In comparing results of the four drug regimens in the four buildings on parallel therapy, the only observed difference in drug activity was against *D. fragilis*. Oxytetracycline was significantly more effective than any of the other medications in reducing the prevalence of this parasite. All of the regimens apparently eliminated the few known infections of *I. buetschlii* and were more effective against *E.*

histolytica than against *E. coli* or *E. nana*. This selective action of amebicides in man, particularly the ease of eliminating infections of *I. buetschlii*, has been observed by others (1, 8).

The fact that no significant differences were observed in the activity of the four regimens against *E. histolytica* does not, of course, mean that none existed. The four drugs were randomly assigned to patients in four buildings since it was realized at the outset that differences in opportunity for reinfection would make it difficult to compare groups of patients receiving different medications. By randomization, reinfection opportunities were made more nearly equal. The results suggest that reinfections occurred frequently in most of the buildings so that even if certain drugs were significantly more effective than others, the differences may have been masked by the time post-treatment examinations were made. If the investigation had been directed specifically toward drug evaluation rather than toward control, more frequent post-treatment examinations would have been made. This would have required additional technical help, which was not available.

Some differences in drug activity are suggested by the results obtained in the buildings on single therapies. For example, oxytetracycline alone or combined with carbarsone appeared somewhat more effective than the other drugs (fig. 3). Although the superiority of this combination was observed in the treatment of acute amebiasis in Korea (3), caution must be exercised in drawing conclusions from results in the single therapy buildings since the patients were not similar in each building, and in some instances the drugs were given at different times of the year.

Although other workers have reported on mass therapy of patients in selected buildings of mental institutions (1, 9, 10), to our knowledge, this investigation constitutes the first attempt to control amebiasis in an entire institution by mass therapy. Although only limited success was obtained, the authors still believe that mass therapy constitutes the only practical approach to control in mental institutions with amebiasis problems.

Theoretically, the administration of a 100

percent effective drug, combined with a thorough cleanup campaign, would solve the problem. Lacking these two, perhaps idealistic, conditions, the administration of less effective drugs at intervals more frequent than 6 months may accomplish the elimination of *E. histolytica* in such relatively confined populations as exist in mental institutions. Berberian and co-workers (9) found that, after mass therapy with bismuth glycolylarsanilate and chloroquine phosphate, weekly administration of the same combined therapy to one part of the initial population reduced the infection rate of *E. histolytica* to 25 percent and daily administration to another group reduced the rate to 10 percent of the pretreatment levels. Although these results are encouraging, the intervals between treatments are too frequent for practical application in most institutions.

Summary

In an institution of approximately 1,600 mentally deficient patients living in 8 separate buildings, examination of single stool specimens from 667 individuals indicated that at least 29 percent harbored *Entamoeba histolytica*. Prevalence rates ranged from 7 to 64 percent from building to building.

Preliminary tests of mass therapy in the building with the highest prevalence of *E. histolytica* showed that single courses of oxytetracycline did not eradicate all infections and that the incidence of infection rose to one-half of the pretreatment level by the end of 6 months.

When mass therapy was extended to the entire institution, each patient was given 1 of 4 drug regimens—carbarsone, iodochlorhydroxyquin, oxytetracycline, and a combination of oxytetracycline and carbarsone—on 2 occasions 6 months apart. On the second occasion, the drug was changed for each person. Results of examinations performed 6 months after each medication indicated that mass therapy was successful in reducing the prevalence of *E. histolytica* in 7 of the 8 buildings but that the species apparently was "eliminated" in only 3 buildings. The effectiveness of therapy appeared to be related to the prevalence rate of *E. histolytica* in each building prior to medication and to the general level of personal hygiene of the patients.

No significant differences were observed in the relative effectiveness of the four drug regimens against *E. histolytica*. However, since the study was primarily concerned with control of infections and was not specifically designed for the evaluation of drugs, this result cannot be taken as conclusive.

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SUPPLY REFERENCE

Charles Pfizer and Co., Brooklyn, N. Y., Eli Lilly and Co., Indianapolis, Ind., and Ciba Pharmaceutical Products, Summit, N. J., provided the drugs used in the tests.

Conference on Nurse Traineeship Program

A national conference to evaluate the professional nurse traineeship program of the Public Health Service (title II, P. L. 84-911) will be held in Washington August 13-15, 1958. The program provides financial aid to graduate nurses preparing for teaching, supervisory, or administrative positions in nursing. Since its inception in 1956, the program has awarded 1,387 traineeships through 60 schools of nursing and public health. Funds allocated by Congress total \$5 million.

About 80 recognized authorities from the fields of nursing education, medicine, hospital and public health nursing service, hospital administration, education, and public health administration will participate in the conference. They will determine the adequacy of the traineeship program in meeting the need for administrators and teachers of nursing and make recommendations as to possible modifications in the program.

Dr. John Millett, previously on the President's Committee on Administrative Management, the Social Science Research Council, and the National Resources Planning Board, and currently president of Miami University, Oxford, Ohio, will serve as chairman of the conference.

Neonatal Response to DTP Vaccines

L. S. GOERKE, M.D., M.S.P.H., PAULINE ROBERTS, M.D., M.P.H., and JOHN M. CHAPMAN, M.D., M.P.H.

IMMUNIZATION and vaccination during the first, second, or third month of life has been advocated by health authorities to provide protection during the period of greatest vulnerability to infection (1-4). As infants are susceptible to pertussis from birth, and fatality is highest during the first 6 months of life, delay in pertussis immunization until 3 to 6 months of age fails to prevent most of the deaths from this disease. In addition, the advent of routine poliomyelitis vaccination requires establishing optimum immunization schedules for diseases for which specific prevention is now available. General concern over the ability of the infant to respond during the first month of life to a variety of antigens, singly or in combination, has deterred early immunization procedures. The tendency to delay immunization has also resulted from unwillingness to expose the newborn to local and systemic reactions that may accompany injection.

Antigens that will stimulate maximum protection in the newborn with a minimum of side reactions are diligently sought. The choice of antigen is complicated by the variation in potency of available preparations (5). Our study measures response to combined immunization initiated within the first 2 weeks of life, compares the response to aluminum phosphate and

aluminum hydroxide adsorbed antigens, and observes local and systemic reactions following the use of each of these preparations.

Method of Study

A group of 112 maternity cases in the seventh and eighth month of pregnancy was selected for study from prenatal clinics of the Los Angeles City Health Department. These patients were selected on the basis of their willingness to cooperate, freedom from disease, stabilized marriage, and stable residence pattern.

Patients in the study were delivered at the Los Angeles County General Hospital. At term or at delivery a 10-ml. sample of blood was collected from the mother. Cord blood specimens were also requested. These specimens were followed by 5-ml. specimens of whole blood collected from the infants at intervals of approximately 1 month, 6 months, and 1 year following completion of diphtheria-tetanus toxoid and pertussis vaccine (DTP) inoculations. The Los Angeles City Health Department laboratory obtained agglutination titers and performed antibody titrations.

Pertussis agglutination titers, based upon the ability of the patient's serum to agglutinate a standard number of *Haemophilus pertussis* organisms, were obtained according to standard methods (6), except that the organisms were incubated overnight at 37° C. and not at room temperature. The titer represents the highest serum dilution showing a 2-plus reaction.

Diphtheria antitoxin titration was performed according to a modification of the method of Frobisher (7). The titration was based on the standardization of a diphtheria toxin, the end reaction in the presence of a known amount of

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antitoxin producing a zone of erythema approximately 1 cm. in diameter in the skin of a guinea pig. A dilution of serum that gave the same reaction as the standard antitoxin to the same amount of toxin was recorded as the same amount of antitoxin as the standard. The response to tetanus toxoid was not determined in this study.

As soon as possible following discharge from the hospital, the infants received the first of three intramuscular (lateral gluteal) 0.5-ml. injections of commercially prepared DTP. Aluminum phosphate adsorbed antigens and aluminum hydroxide adsorbed antigens were used in alternate infants. Each 0.5 ml. dose contained the equivalent of 30 billion *H. pertussis* organisms. All of the initial injections were given within the first 14 days after birth except for one set of twins who were not available for immunization until the 19th day. The first injection was given in the home. The second and third doses were scheduled at intervals of 4 weeks. Followup home visits were made by public health nurses or by physicians to obtain case histories, to observe reactions, and to schedule clinic visits for subsequent injections and collection of specimens. One child health conference session was reserved weekly at the health center for the study cases. Every effort was made to adhere as closely as possible to the schedule for inoculations and collection of specimens. If the patient failed to appear at the clinic as scheduled, the injections were given and the blood specimens collected in the home within 10 days.

Classification of local reactions was based upon the degree of erythema and induration at the site of injection. Local reaction was recorded as mild, moderate, or severe according to the following definitions:

Mild: Erythema of less than 3 cm. in diameter and/or induration persisting for not more than 2 days, or small persistent nodule.

Moderate: Erythema of 3 cm. or more in diameter with induration persisting for more than 2 days.

Severe: Induration progressing to necrosis or accompanied by a wide area of erythema.

Systemic reactions were classified as:

Mild: Temperature not more than 100° F., restlessness, drowsiness, or irritability of less than 12 hours.

Moderate: Temperature up to 101° F., symptoms of illness persisting for 12 hours or more.

Severe: Temperature above 101° F., in the presence of symptoms and signs of illness.

Results

From the 112 pregnant women who entered the study, 93 newborn infants were available for followup. Of these, 78 completed the series of inoculations and submitted at least one postvaccination blood specimen. Second specimens were obtained from 72 infants and third specimens from 54. The median age at the time of collection of each of the 3 specimens was 3.2 months, 8.5 months, and 15 months.

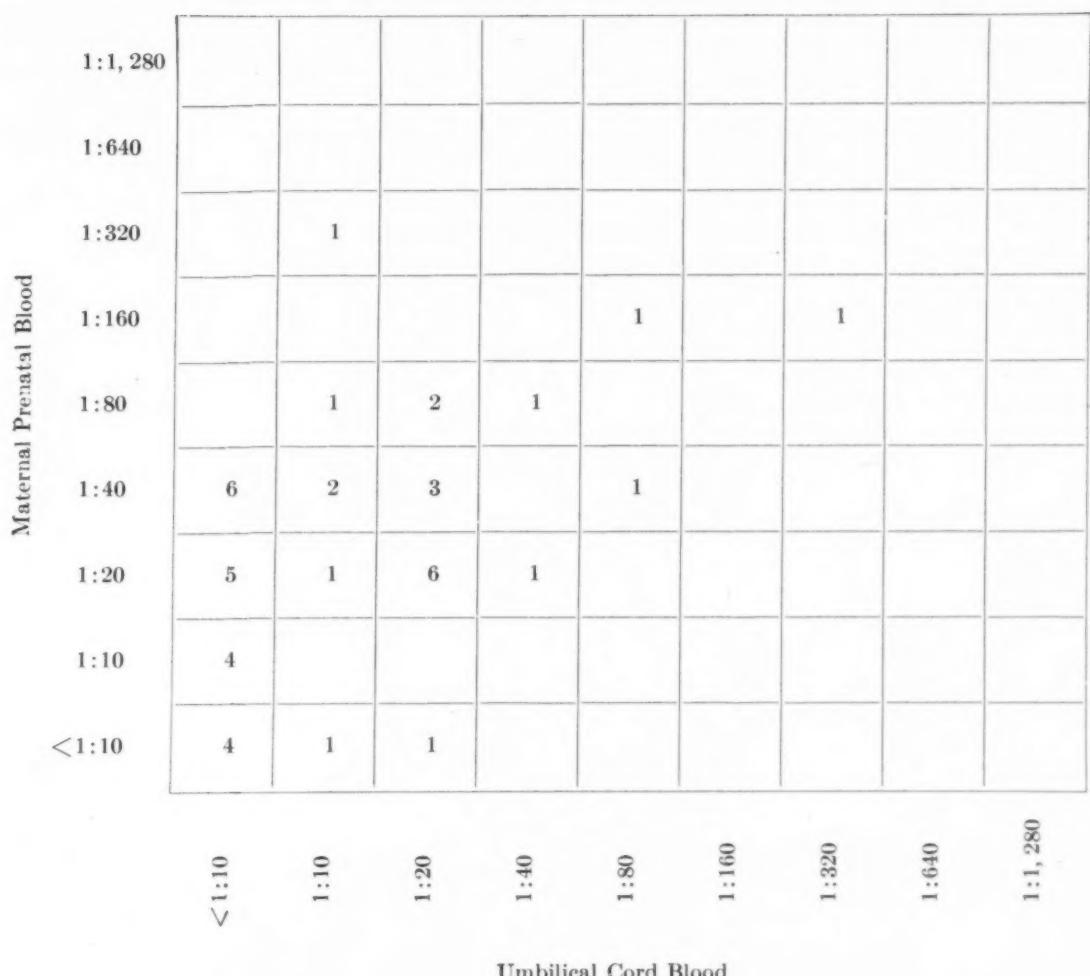
Response to Pertussis Vaccine

The distribution of "prevaccination" titers (as reflected by maternal and cord blood specimens) and of postvaccination titers for infants

Table 1. Pertussis agglutination titers

Titer	All mothers	Mothers of infants in study	Cord	Infant postvaccination		
				1 month	6 months	1 year
1:1,280	0	0	0	1	0	1
1:640	0	0	0	5	1	2
1:320	0	0	1	3	9	2
1:160	6	5	0	14	9	8
1:80	6	5	2	11	12	10
1:40	8	7	2	7	4	4
1:20	17	15	12	7	10	7
1:10	22	18	6	5	6	5
<1:10	53	43	19	25	21	15
Total	112	93	42	78	72	54

Figure 1. Pertussis agglutination titers, maternal and cord blood



is shown in table 1. Of the 93 mothers with infants in the study, 61 (65.6 percent) had titers of 1:10 or less. Only 5 had titers greater than 1:80. Cord blood specimens were submitted for testing following 42 deliveries. The quantitative distribution of maternal prenatal and the corresponding cord blood pertussis agglutination titers is shown in figure 1. Higher titers were observed in the corresponding maternal specimens. Titers of 1:10 or less were obtained in 10 of the maternal and in 25 of the cord blood specimens.

The agglutination titers at the time of the first postvaccination bleeding (1 month following third DTP injection), according to the antigen used, are shown in table 2. Higher agglutination levels were observed among the 41 infants who received the aluminum phosphate

adsorbed antigen. The median titer among infants receiving the aluminum phosphate antigen was 1:80 as compared with a median titer of 1:10 among 37 infants receiving the aluminum hydroxide adsorbed antigen.

One month postvaccination titers were determined in 30 of the infants for whom the agglutination level of cord blood was observed at birth (fig. 2). Fifteen of these infants received aluminum phosphate and 15 aluminum hydroxide adsorbed antigen. A comparison of specimens tested 1 month after completion of vaccination with the cord blood specimens shows that 11 infants who received aluminum phosphate and 2 who received aluminum hydroxide adsorbed antigen had an increase in the pertussis agglutination titer to 1:80 or greater.

The ability to maintain the agglutination

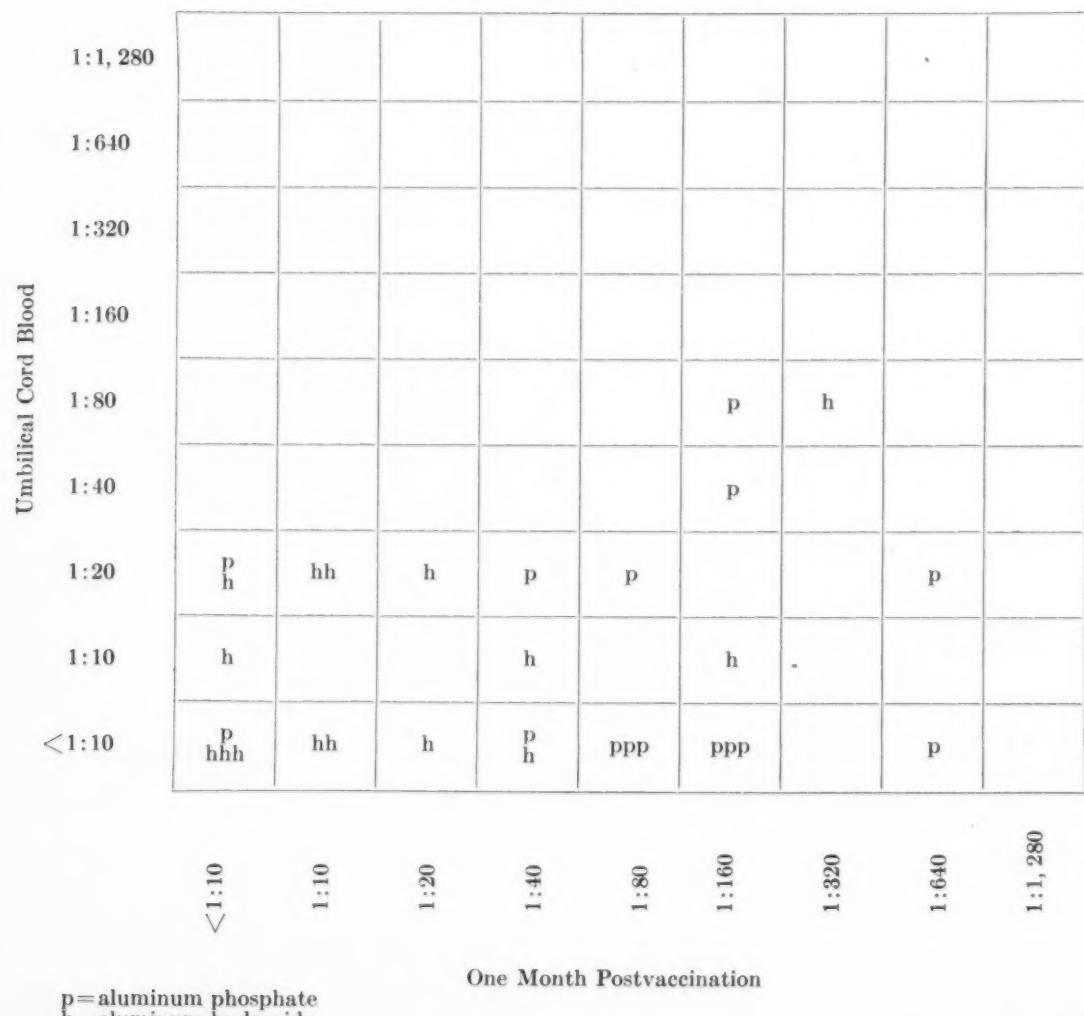
titer is observed by comparing the titer at the third postvaccination bleeding (1 year after completion of vaccination) with the titers on first postvaccination bleeding (fig. 3). Among the 54 infants from whom 1-month and 1-year postvaccination blood specimens were obtained, 28 received the aluminum phosphate and 26 the aluminum hydroxide adsorbed antigen. Among those receiving aluminum phosphate adsorbed antigen 19 had titers of 1:80 or higher 1 month following vaccination. Of these, 15 had titers of 1:80 or more 1 year following vaccination. Among the infants receiving aluminum hydroxide who were successfully followed for 1 year, 3 had titers of 1:80 or more 1 month following vaccination. One of these

Table 2. Pertussis agglutination titers 1 month following vaccination, by type of antigen

Titer ¹	Aluminum phosphate	Aluminum hydroxide
1:1,280	1	0
1:640	5	0
1:320	2	1
1:160	12	2
1:80	9	2
1:40	2	5
1:20	2	5
1:10	0	5
<1:10	8	17
Total	41	37

¹ Median for aluminum phosphate is $<1:80$; aluminum hydroxide is $>1:10$.

Figure 2. Pertussis agglutination titers of cord blood and 1-month postvaccination blood specimens, by type of antigen



p = aluminum phosphate
h = aluminum hydroxide

had a 1:80 titer and two had 1:10 titer or less 1 year later. Of the 23 infants injected with aluminum hydroxide who had titers less than 1:80 one month following vaccination, 5 had titers of 1:80 or more one year later. Observation of the serum agglutination titers 1 month and 1 year after vaccination indicates that once agglutinins are stimulated, the aluminum phosphate adsorbed antigen was the better of the two in maintaining the titer for 1 year.

Response to Diphtheria Toxoid

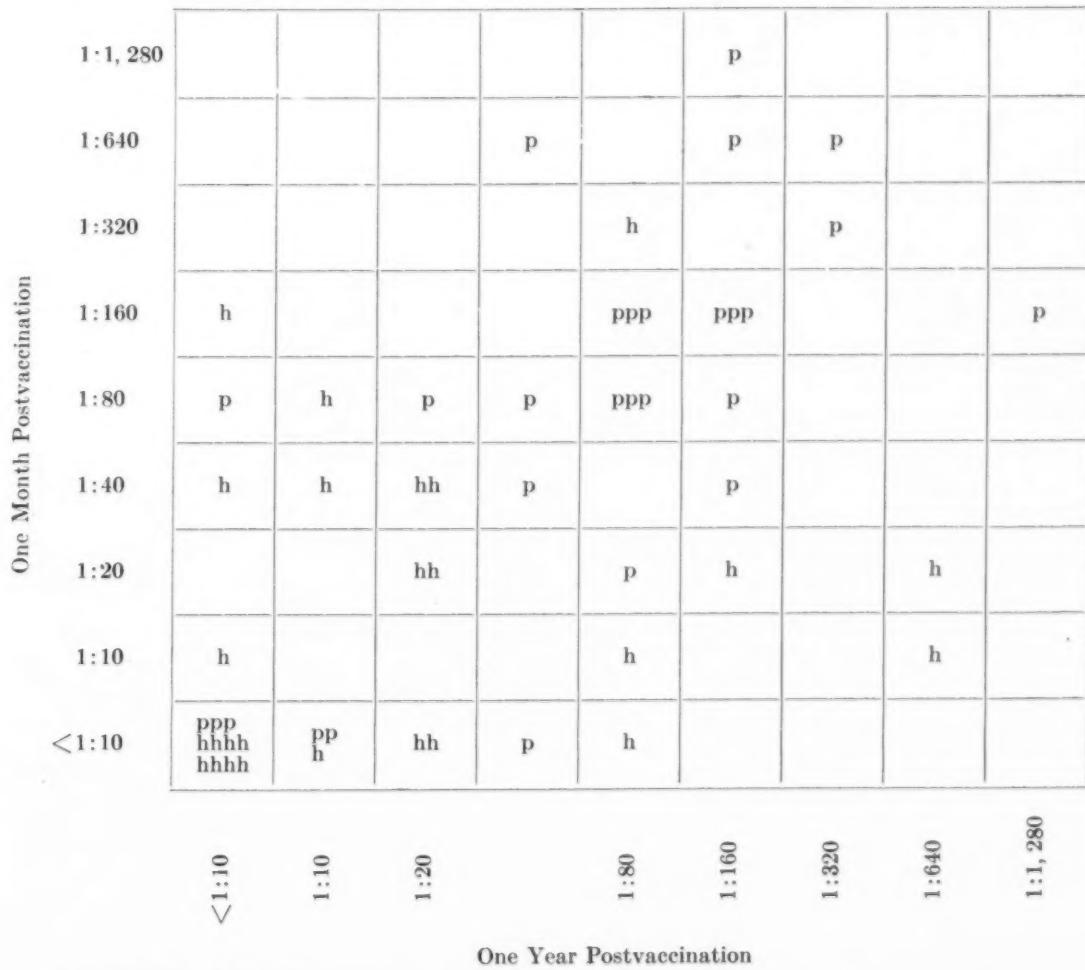
Closer agreement was observed between maternal and cord blood diphtheria antitoxin levels (fig. 4) than in pertussis agglutinins (fig. 1). In 9 of 42 cases there was no demonstrable diphtheria antitoxin (less than 0.01 units per

ml.) in maternal and cord blood. Both maternal and cord blood revealed 0.01 units per ml. in 7 cases, 0.1 unit in 12 cases, and 1.0 unit in 2 cases.

Among the 30 infants with a cord blood and 1 postinoculation specimen, 18 showed increases in antitoxin level by the first month after completion of the injections, 9 remained the same, and 3 had a lower level than was observed in the cord blood (fig. 5). The results according to antigen used are as follows:

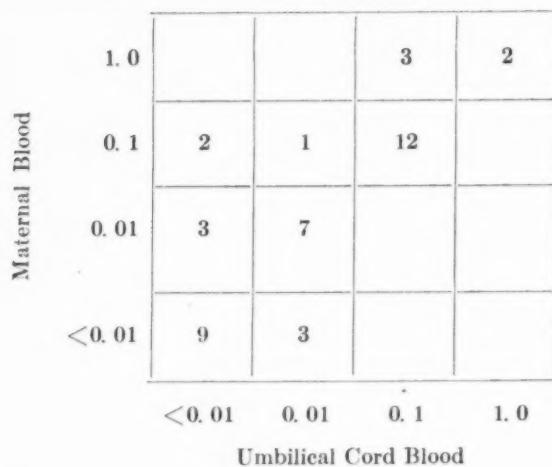
	Phos- phate	Hydrox- ide	Total
Titer increase-----	9	9	18
Titer same-----	4	5	9
Titer decrease-----	2	1	3
Total-----	15	15	30

Figure 3. Pertussis agglutination titers 1 month and 1 year following vaccination, by type of antigen



p = aluminum phosphate
h = aluminum hydroxide

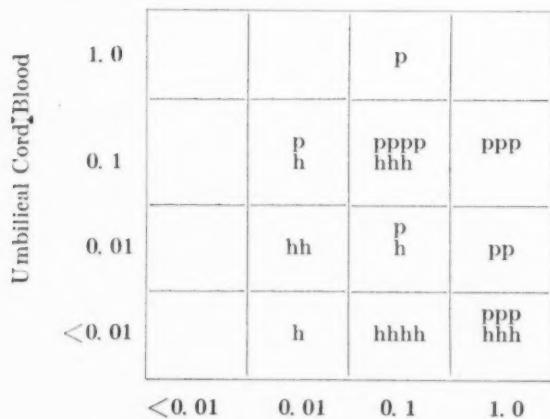
Figure 4. Diphtheria antitoxin units per milliliter, maternal and cord blood.



Although higher titers were observed 1 month following inoculation in the group receiving the aluminum phosphate antigen, these infants also had higher titers in the preinoculation cord blood specimens (fig. 5). There were no differences in the antigens when response was based upon increase in titer.

Titration of diphtheria antitoxin 1 year after completion of the DTP injection can be compared with the levels observed at 1 month following the third injection in 54 infants from whom 1-month and 1-year postvaccination

Figure 5. Diphtheria antitoxin units per milliliter, cord blood and infant blood 1 month following immunization.

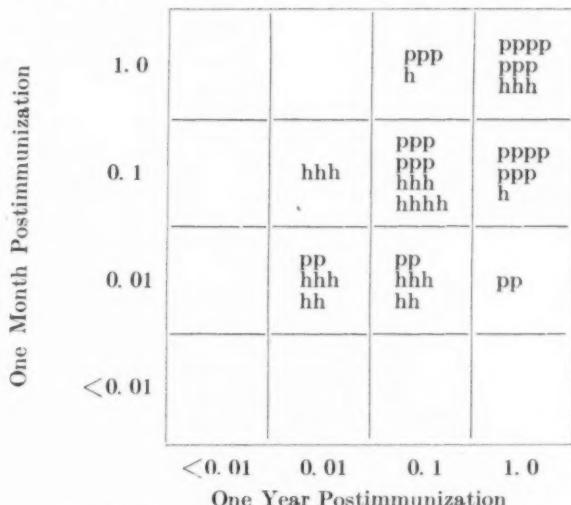


Infant Blood 1 Month After Immunization

p=aluminum phosphate
h=aluminum hydroxide

specimens were obtained (fig. 6). Twenty-five of these infants had received the aluminum hydroxide and 29 the aluminum phosphate adsorbed antigen. Thirty infants maintained the same level of antitoxin units per ml., equally distributed between the two antigens. An increase at 1 year was noted in 17 of the 54 infants, including 6 of the 25 who had received aluminum hydroxide adsorbed antigen and 11 of the 29 receiving the aluminum phosphate antigen. The antitoxin level was lower at 1

Figure 6. Diphtheria antitoxin units per milliliter, 1 month and 1 year following immunization.



p=aluminum phosphate
h=aluminum hydroxide

year in 7 of the infants, 4 of whom had received aluminum hydroxide antigen and 3 aluminum phosphate antigen. No differences were observed in the ability of the two antigens to maintain antitoxin levels of 1.0, 0.1, or 0.01 units per ml. at 1 year following completion of immunization.

Combined Protection

Table 3 presents the combined results of pertussis agglutination and diphtheria antitoxin titration 1 month after the third inoculation. These data may be observed at any agglutination and antitoxin level for pertussis and diphtheria. Selecting as a criterion a titer of 1:160 or more for pertussis protection and at least 0.1 antitoxin unit per ml. (AU/ml.) for

Table 3. Pertussis agglutination and diphtheria antitoxin titration 1 month following completion of DTP inoculations, by type of antigen

Pertussis titration	Diphtheria antitoxin units per ml.									
	Aluminum phosphate					Aluminum hydroxide				
	<0.01	0.01	0.1	1.0	Total	<0.01	0.01	0.1	1.0	Total
1:1,280				1	1					0
1:640		1	1	3	5					0
1:320			8	1	9					1
1:160		1	6	5	12					2
1:80			4	5	9			1	1	2
1:40		1		1	2		2	2	1	5
1:20			1	1	2		2	2	1	5
1:10					0		2	2	2	6
<1:10		3	5		8		7	8	4	19
Total	0	6	25	17	48	0	14	17	9	40

diphtheria protection, the following results are obtained.

	PHOSPHATE		HYDROXIDE	
	Number	Percent	Number	Percent
Failure	23	48.0	37	92.5
Success	25	52.0	3	7.5
Total	48	100.0	40	100.0

Selecting a titer of 1:80 or more for pertussis and at least 0.01 AU/ml. for diphtheria as a criterion for protection, the differences in the percent of successes and failures for the two products are greater.

	PHOSPHATE		HYDROXIDE	
	Number	Percent	Number	Percent
Failure	12	25.0	35	87.5
Success	36	75.0	5	12.5
Total	48	100.0	40	100.0

Differences in the antigens with respect to combined diphtheria and pertussis protection 1 year following the inoculations may be derived from table 4. Requiring agglutination at 1:160 dilution and 0.1 AU/ml. as a criterion, 35.5 percent of the infants receiving the aluminum phosphate and 11 percent of those receiving aluminum hydroxide were protected 1 year after the last inoculation. At the levels of 1:80 agglutination and 0.01 AU/ml., 58 percent of the infants injected with aluminum

phosphate antigen, and 22 percent injected with aluminum hydroxide were protected at 1 year.

Reactions Following Injections

Infants were observed for local and systemic reactions following 283 of the injections. Local reactions ranging from mild to severe were observed following 55 of the injections (19 percent). Systemic reactions ranging from mild to moderate, according to the criteria used, followed 33 injections (11 percent). Local reactions occurred among 33 (23 percent) of the 147 who received aluminum phosphate adsorbed antigen and among 22 (16.2 percent) of 136 receiving aluminum hydroxide adsorbed antigen injections. Of the 30 systemic reactions, 12 followed the aluminum hydroxide, and 18 the aluminum phosphate antigen. The differences observed are not statistically significant.

Discussion

The data indicate that of the two antigens used, the aluminum phosphate adsorbed product is superior in combined diphtheria and pertussis neonatal immunization. The possibility that factors other than antigenicity could have influenced the results must be considered. Although losses from the study impose important limitations, the losses were equally divided according to the antigen used. Of 21 infants

Table 4. Pertussis agglutination and diphtheria antitoxin titration 1 year following completion of inoculations, by type of antigen

Pertussis titration	Diphtheria antitoxin units per ml.									
	Aluminum phosphate					Aluminum hydroxide				
	<0.01	0.01	0.1	1.0	Total	<0.01	0.01	0.1	1.0	Total
1:1,280				1	1					0
1:640				0	0					2
1:320				2	2					0
1:160			2	6	8					1
1:80		5	2	7					3	3
1:40		3	3	6						0
1:20			1	1			1	4	1	6
1:10	1	1	3	4			2	9		2
<1:10							4			13
Total	0	2	14	15	31	0	8	15	4	27

lost to the study before the third postvaccination specimen, 11 were in the aluminum phosphate group and 10 in the aluminum hydroxide group.

While the two antigens appeared comparable with respect to the diphtheria toxoid component, when viewed in the light of ability to meet the criteria set on the basis of antitoxin units per milliliter and agglutination titers, the aluminum phosphate adsorbed antigen was better than the aluminum hydroxide adsorbed antigen. In view of the multiplicity of factors that govern the occurrence of disease, including dosage of infection, specific immunity, and other resistance factors, it is difficult to establish arbitrary pertussis agglutination and diphtheria antitoxin levels above which a person is immune and below which he is susceptible. By utilizing the data in tables 3 and 4, however, one may compare the response to the antigens according to any desired combinations of pertussis agglutination and diphtheria antitoxin levels.

In general, the infants tolerated the inoculations very well. Many of the mild systemic reactions occurring within a few hours of injection were reported by the parent. Possibly, some of these were over-reported. Some of the local reactions observed by physicians and nurses, however, were unnoticed by the parent. Sauer observed a lower frequency of systemic and local reactions following aluminum phosphate adsorbed antigens than were observed

following the use of alum precipitated antigens (8). In our experience local and systemic reactions are more frequently discovered when infants are systematically observed by physicians or nurses than when the frequency of reaction is based on reports by the parent.

The results of the study support neonatal inoculation as a safe, effective, acceptable procedure. The type of antigen used appears to be of importance in view of the variations observed in response to available preparations. Furthermore, the loss of immunity as indicated by the agglutination and antitoxin levels 1 year after the third inoculation reemphasizes the need for a fourth injection or booster dose at approximately 1 year of age or earlier.

Summary

A group of infants was inoculated during the neonatal period with aluminum phosphate adsorbed or aluminum hydroxide adsorbed diphtheria-tetanus toxoid and pertussis vaccine, combined. The infants were observed up to 1 year following completion of the series of three inoculations.

Based on diphtheria antitoxin titrations, responses to the aluminum phosphate and aluminum hydroxide adsorbed antigens were comparable.

Based on pertussis agglutination titers 1 month and 1 year following vaccination, the aluminum phosphate was better than the alumi-

num hydroxide adsorbed preparation. Better combined protection against diphtheria and pertussis followed inoculation with the aluminum phosphate adsorbed antigens.

No differences in local or systemic reactions following the two types of antigens were observed.

The data confirm the desirability of a fourth dose or booster dose at 1 year of age when inoculation is begun during the neonatal period.

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Conference on Training

Sixty-five representatives of professional and educational groups will attend a national conference on public health training to be held in Washington, D. C., July 28-30, 1958, under the sponsorship of the Public Health Service.

Dr. Berwyn F. Mattison, executive secretary of the American Public Health Association, will be chairman of the meeting. Dr. Malcolm H. Merrill, director of the California Department of Public Health, will summarize conference conclusions.

The meeting will review responsibilities of local, State, and Federal agencies for the training of public health personnel. The Health Amendments Act of 1956 requires that a national conference be held to assist the Surgeon General of the Public Health Service in evaluating the public health traineeship program authorized by the act. The act also requires the Surgeon General to make an evaluation report to Congress by January 1, 1959.

The purpose of the traineeship program is to help alleviate the acute shortage of trained personnel in public health agencies. Under the act, the Public Health Service awards traineeships to individuals and makes training grants to schools offering graduate courses in public health. From August 1956 through April 1958, almost 1,000 persons received graduate training in public health through this program.

Poliomyelitis Vaccination Campaign in Salt Lake City, Utah

JAMES E. BOWES, M.D.

ALMOST 400,000 shots of poliomyelitis vaccine were given in a mass immunization campaign in Salt Lake City, Utah, in 1957. From the inception of the campaign, arising from pressures of various civic groups early in 1957, until its end in July of that year, streams of people passed through clinics in schools, churches, department stores, and other places to receive their injections.

A total of 116,710 vaccine injections were given at clinics held in 127 schools, 25 churches, and 40 industrial firms, business offices, and stores. In addition, 275,130 injections were given in the offices of private physicians. Altogether, 62 percent of the city's residents were immunized.

The Salt Lake County Medical Society sponsored the vaccination program and appointed me as coordinator. Scheduling of clinics for all schools was begun at once through my office. Within 4 weeks all the schools and businesses that sought vaccination for their employees were accommodated. The nurses and equipment were supplied by the Salt Lake City and County Health Departments.

The first clinics were arranged for 500 employees of a major department store and for a junior high school where two students had died of poliomyelitis in 1956. For the school clinic, the PTA purchased vaccine from a local druggist at the commercial rate until it could be bought at the institutional price directly from drug firms.

The second school clinic was sponsored by a local Lion's Club. Newspaper and radio publicity resulted in a crowd of 2,450 persons. The challenge here was to obtain enough syringes so that there would be a separate one for each person.

Dr. Bowes is a private physician practicing obstetrics and gynecology in Salt Lake City, Utah.

The city health department had only 1,500 syringes. Four hundred more, relics of the poliomyelitis pioneer programs, were found in the basement of the State Capitol. All hospitals were asked to have syringes ready in case of need. Since the second clinic was to last from 6 p.m. until 10 p.m., the first 300 syringes used were cleaned, packed, and rushed to a nearby hospital for autoclaving and were returned for the last hour.

The problem of syringes continued to be the knottiest one of all throughout the campaign. Disposable syringes were too expensive: at 18 cents per unit, it would have meant \$180 in the waste basket for every 1,000 persons injected. Interchangeable 2 cc. syringes were best. Dr. Hingson's jet-injector, which injects 900 persons per hour would have been ideal, but it was not then available.

Monetary Considerations

When the immunization program was first considered, several physicians were opposed to mass clinics, preferring individual vaccinations in their offices. The medical society, believing that this method would fail to meet the citywide demand on short notice, agreed to a fee of \$15 per hour to be paid physicians who worked in the clinics.

At most of the clinics, each person was charged \$1, which covered the following costs: vaccine, 65¢; replacement of broken syringes, 3¢; cotton, alcohol, and acetone, 3¢; physician's fee, 7¢; and a surplus of 22¢ to allow for indigent persons. (Unused Federal funds were also allocated to purchase vaccine for anyone under 20 years of age and pregnant women. Free injections were given at the city and county health departments during August 1957. All nurses canvassed their areas and encouraged indigent groups to take advantage of this offer.)

The charge was as high as \$1.25 in some of the business offices and stores since their vaccine was purchased at the commercial rate. A few stores absorbed the entire cost of vaccinating their employees.

The county health commissioner purchased \$36,000 worth of vaccine for the school and church clinics. Clinic sponsors reimbursed the commissioner at cost.

Publicity and Promotions

When plans for mass clinics were announced, one Salt Lake City newspaper, the *Deseret News*, carried a daily schedule of clinics that gave the time and place of all mass clinics for the coming week and information on how to schedule a new clinic with the medical society. They covered the progress of the local vaccination campaign and the national poliomyelitis situation. Thus, the mass immunization program was kept constantly before the public.

Vaccination reminders were sent to 97,000

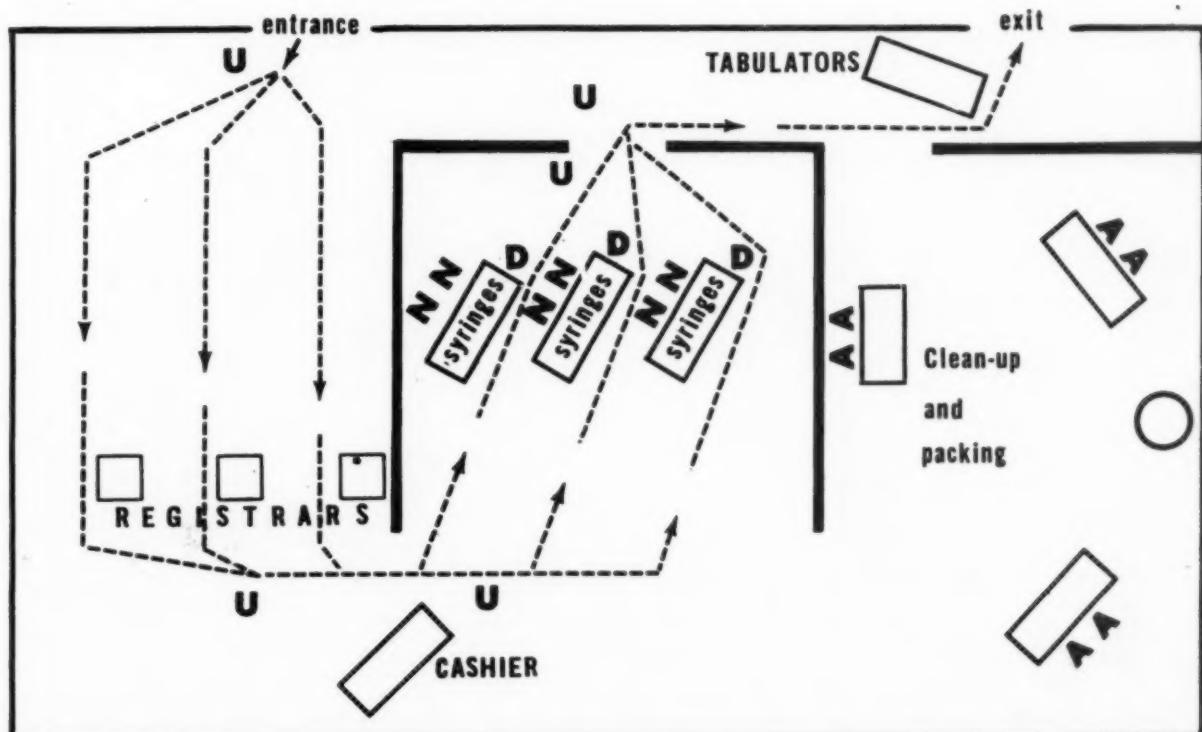
homes by 1 bank and 7 department stores along with their monthly statements. "Polio Won't Wait, Vaccinate" posters were placed in show-windows of downtown stores, utility companies, and banks. Newspaper advertisers used 1-inch squares of the same poster as inserts on their advertisements during the last 2 weeks of July.

Daily radio announcements were broadcast for the last 2 weeks of the clinics. There were six free-time, 10-minute interviews of different physicians concerning the need for Salk vaccinations.

One studio televised a "live" poliomyelitis immunization clinic for more than 100 employees. The vaccination of the employees was completed in 20 minutes by one physician, who carried on an interview while administering the injections.

As a promotional stunt, during the second school clinic, searchlights illuminated the area outside the school, and trade stamps were given with every injection. At the last clinics, free soft drinks were served.

Typical Clinic Design for Mass Vaccinations



Vaccine Shortage

A vaccine shortage in March created a momentary panic in the poliomyelitis committee, for two big clinics of nearly 1,000 each had been scheduled. The *Deseret News* contacted the Public Health Service in Washington, D. C., about the shortage and found it was nationwide. Mass clinics throughout the country had exceeded the manufacturers' estimates.

Telephone calls on this black March 13 to a drug firm brought part of our back order in 4 days. The National Foundation for Infantile Paralysis gave me \$1,000 to purchase any vaccine available in the State. Only twenty 9-cc. vials of Salk vaccine were found in 24 drug-stores in 8 cities.

In the meantime, the National Foundation found 500 vials of vaccine in Reno, Nev., not being used. It was shipped by commercial airline in time for the clinics that night. A 1,200-bottle shipment came through in several days and kept us going for another month.

On April 11, another vaccine shortage occurred because of a delay in shipment. *Deseret News* officials arranged with the Utah Air National Guard to send a jet to Indiana to pick up 1,200 bottles of vaccine. The airplane made the 3,000 mile roundtrip flight in 10 hours, returning the same day with enough vaccine for that night and the next several weeks.

By mid-April, private physicians were short of vaccine. We visited a drug wholesaler and found the problem was at the manufacturers'

Poliomyelitis Vaccination in Bucks County

A Japanese print called "A Chest Full of Goblins" was used as a scary eye-catcher in a poliomyelitis vaccination campaign by the Bucks County (Pa.) Department of Health through county newspapers, beginning in early March 1958.

"Bucks County needs 400,000 more polio shots" were key words used in the opening statement of the campaign by Dr. Jackson Davis, director of the Bucks County Department of Health.

He commended the medical society of the county for its vote in February to encourage physicians to set up office hours periodically for administering poliovirus vaccine at a reduced fee, and urged a call to the family doctor to learn the hours set. Dr. Davis emphasized that "the odds are now 2 to 1 for paralysis if your child under 5 years gets poliomyelitis."

Statistical facts which he gave for the disease disclosed no confirmed cases in Bucks County in 1957, in spite of the fact that only 40 percent of the most vulnerable group, infants and children under 5 years of age, had received even one injection of poliovirus



vaccine. "Will our luck hold in 1958?" he asked.

The approximately 225,000 poliomyelitis shots that were administered in Bucks County, he pointed out, were chiefly in children 5 through 19 years of age.

level. Long-distance telephone calls revealed that four manufacturers favored bulk sales of vaccine to public health agencies; only small amounts were for distribution directly to physicians. One manufacturer was willing to split 50 percent of Utah's quota with commercial outlets for the private physician's use. Another manufacturer offered to make 2,000 bottles available to us immediately, on the condition that we purchase it through a public health agency.

A Salk vaccine bank was formed to provide vaccine for the mass clinics and to lend it to any physician in our county who could not obtain it through commercial sources. Responding to statewide demand, we lent 11,000 injections to 80 different physicians, 21,600 injections to 16 county health units in Utah, 140 to the Army and Air Force, and supplied 2 hospitals and 2 universities. Nearly every borrower returned the vaccine after commercial supplies were available.

School Survey

Since one of the prime objectives of the campaign was to immunize the school children in time for the poliomyelitis season, we conducted a survey to see if the objective was being met. A survey, based on the number of children present on 1 day, was conducted in all the city's 41 grade schools, 11 junior high schools, and 3 high schools.

Good immunization coverage was found in all grade and junior high schools in the upper third economic areas. However, 20 to 35 percent of the children in the poorest economic areas never received a single poliomyelitis injection. Two high schools still had 35 percent of its students without vaccinations.

A clinic was arranged in each school where there were at least 40 students present who had never been vaccinated. Since only the sixth and seventh grades were considered reliable in our survey, the need in the lower grades was estimated proportionately to the response in the upper classes.

Clinics were held during 1 class hour in 31 schools over a 3-day period. During these "mop-up" clinics, 1,980 injections were given, greatly increasing the immunization level. The

\$1 charge was waived for any child who could not afford it.

Final Phase of Clinics

For the conclusion of our program, we set up 17 city and suburban clinics in schools throughout the area. We held only 1 clinic each day, from 1 p.m. to 8 p.m., so that the full staff of city and county health department nurses and all syringes and needles would be available.

Since this period lasted 16 days, persons getting a first shot during the initial July clinics could attend one again in 14 days and receive their second injection. Dr. John G. Bachtold and Dr. Louis P. Gebhart, virologists of the University of Utah, advised the committee on the effectiveness of spacing the various injections. Since the poliomyelitis season was fast approaching, they allowed a minimum 10-week interval between the second and third injections rather than the usual 7 months.

At 9 city clinics, injections were given 17,443 persons, and at 8 suburban clinics 11,963 were vaccinated. More than 4,000 of these received their first shots. At the last clinic, held on July 31, 1957, we vaccinated 3,500 persons.

Operations

The accompanying figure depicts our flow chart when 1,000 persons were expected to be vaccinated within 1 hour's time. This rate of injections required 3 doctors, 6 nurses, 6 clerks, 6 ushers, and 6 women for cleaning and packing syringes.

The best attendance was at 6 p.m., and the worst between 2 p.m. and 4 p.m. Nurses began setting up tables and loading syringes 1 hour in advance of a specified beginning time, for it was our experience that if 1,000 persons were expected to attend, more than 100 persons were in line one-half hour before time. We started our injections ahead of time to create public goodwill.

There was no attempt to keep a registry of persons getting injections other than completing a shot-record card and tabulating the number attending.

The nursing service from the Salt Lake City

and County Health Departments was indispensable. After their regular duties, the nurses spent many evening hours setting up and conducting clinics. Hundreds of volunteer nurses assisted them in keeping records, ushering, and cleaning and packing syringes and needles.

Results and Conclusions

Tabulation sheets used at each clinic provided an accurate count of the injections given. In the city, the number was 66,170, while in the county (suburbs) it was 50,540. A more detailed age distribution record, kept in the

city clinics, revealed our poorest attendance was in the group 15-19 years old. Of those over 40 years old, 11,198 were given injections even though publicity was not directed toward them.

To get an idea of the total immunization coverage in our community, we conducted a telephone survey, sampling the 88,000 private family listings in the directory. A total of 391,840 injections were given. Since the public clinics had administered 116,710 injections, the remaining injections must have been given by private physicians in their offices. An obvious conclusion may be drawn: Mass clinics do not take patients away from private physicians.

School Announcements

University of Minnesota. From July 21 through August 1, 1958, the School of Public Health will hold a workshop on radiological health in industry and the community. The course is designed for physicians, nurses, chemists, sanitarians, and others concerned with such health problems.

Topics to be covered in the workshop include: introduction to radiation; sources of radiation exposure; atomic structure; radioactivity; X-rays; interaction of radiation with matter; units of measurement; natural and artificial background; biological and genetic effects of radiation; maximum permissible levels; principles of radiation protection; and public health aspects of radiological health.

For further information, write to the School of Public Health, 1325 Mayo Memorial Building, University of Minnesota, Minneapolis 14.

Massachusetts Institute of Technology. The Institute offers a 2-week special summer program in air pollution from August 11 through August 22, 1958. Intended primarily for industrial, chemical, mechanical, and sanitary engineers who wish a better understanding of the broad concepts of air pollution control, the program will cover the meteorological

problem, toxicology and public health, aerosol technology and air cleaning, and air analysis, along with legislative and regulatory acts. No formal background, however, is required in meteorology or physiology. Academic credit is not offered. Write the Massachusetts Institute of Technology, Cambridge, for further information.

Harvard University. A new division of environmental hygiene has been added to the School of Public Health. Radiation hazards, air pollution, accident prevention, and industrial hygiene will comprise the curriculum and research activities in the new division.

University of Michigan. The department of environmental health of the School of Public Health has expanded its radiological health curriculum from 1 to 7 courses for the 1958-59 school year.

To the current course on radiological health have been added fieldwork in radiological health; radiation biology; techniques used in radioactive air, water, sewage, and stream pollution studies; radiological health seminar; disposal of radioactive wastes; and a second part of radiological health.

A method based largely on Bureau of the Census data reveals that since 1910 considerable change has occurred in the timing and duration of the period of childbearing in the United States.

Age of Women at Completion of Childbearing

LINCOLN H. DAY, PH.D.

MORE than 90 percent of the women in the United States eventually marry (1), and 85 to 95 percent of those who marry before the age of 45 become mothers (2). Hence, changes in the length and timing of the childbearing period may have important social effects on large numbers of American women and, through them, on the other members of society as well.

This paper will discuss an attempt we have made to determine the proportion of women who had completed their childbearing by the time they had reached certain ages. An analysis of the age-specific birth rates for women in various age cohorts could afford some indication of any change which might have occurred in these proportions; but the method is somewhat inadequate because it not only fails to denote the number of women who had completed their childbearing, but because it also gives only a very crude indication of their age distribution. The method devised by us to assemble the data for this article falls prey to neither of these shortcomings. It is, however, not entirely free of certain others of its own.

The census data from which we derived our basic information are available only for the years 1910, 1940, and 1950. For purposes of

this study it was assumed that a mother had completed her childbearing if she had not borne a child for a period of at least 5 years. Although such an assumption is not invariably true, it was necessitated by the character of the relevant data, data in which mothers were subdivided by whether they were with or without children under 5 years of age.

A partial check of the validity of this assumption was made by the use of recent data on child spacing gathered by Schachter and Grabill (3), together with data from the Indianapolis study analyzed by Whelpton and Kiser (4) and a tabulation of the estimated ages of siblings of 565 freshman scholarship candidates at Mount Holyoke College. On the basis of these rather disparate materials, it appears that not more than 20 percent of the mothers had let 5 or more years elapse between births.

Admittedly, this percentage is somewhat higher than could have been hoped for. A figure closer to, say, 10 percent would have been a better validation of the assumption upon which our study is based. However, the women in each of these three studies went through their childbearing periods during the depression and subsequent war period. The only exception, and it is but a partial one, is the group studied by Schachter and Grabill. The percentage of mothers in their group who had not completed childbearing was somewhat less than the percentage for the other groups. On the basis of

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Whelpton's recent studies of cohort fertility (5), it is likely that this deviation of about 20 percent from our definition of completed childbearing results from the partial making up, by women born between approximately 1903 and 1915, of births postponed during the depression.

Determining the difference in years between the age by which each cohort had borne 25 percent of its births and the age by which it had borne 90 percent, it was found that the difference was greater for the cohorts of 1903-15 than for those born earlier; and that, if present trends continue, this difference will be smallest of all for cohorts born after 1915. Women born before about 1903 seem not to have "made up" for births postponed during the depression; while women born after about 1915 seem to have been little affected by the depression, so far as any necessity to make up for postponed births is concerned.

This making up of births is probably the main factor in the 20 percent deviation from our definition of completed childbearing, although there is also a certain proportion of women who bore an additional child after a period of more than 5 years in each of the census years for which we have data. On the basis of the three studies mentioned above, it would appear that most of these were women who had allowed only 6 years to elapse between successive births.

Estimation of Error

Before making estimates of the proportions of women who had completed childbearing, adjustments were made on the census data themselves in order to lessen as much as possible the chance of error arising from any source other than the basic assumption. One adjustment was for under-enumeration of births; the other, for infant and child mortality.

The 1950 data published in the census report on fertility (2) had been partially adjusted for under-enumeration; those for 1940 and 1910 had not (6a, 6b). In the appendix to its 1945 report on differential fertility (6a) the Bureau of the Census cites certain findings from a special tabulation of schedules from the 1940 census. Undertaken to obtain information on the fertility of ever-married women who had made no report of the number of children ever born

the tabulation revealed striking differences, both in the number of children ever born and in the proportion who had remained childless, between the women who had failed to report on the number of children ever born to them and the women who had so reported. By a method involving the application of two sets of fertility ratios, that is, number of children 0-4 years old per 1,000 women in a given age category, one set from this special tabulation and the other from the regular census enumeration, we were able to make an estimate of the total number of mothers in each age group who had completed childbearing in 1940. Then, on the assumption of relative equality between the respective ratios in 1940 and 1910, we made a similar estimate for the earlier year.

An example of the difference this adjustment for under-enumeration makes is shown in table 1, which compares the proportions of "completed" childbearing derived from unadjusted and adjusted census data for native whites and Negroes. The main difference is found in the earlier ages, denoting considerable under-enumeration of children born to younger mothers. In some instances this has amounted to a decrease between the adjusted and unadjusted figures of 50 percent for native whites and 30 percent for Negroes. That the proportional changes occasioned by adjustment for the effects of under-enumeration were generally larger for whites than for Negroes is due not to a more complete enumeration of Negroes, but to the relatively greater effect on the Negro data of an additional adjustment for infant and child mortality.

An adjustment for infant and child mortality was necessary because of the importance to our calculations of data on the number of mothers with children under 5 years of age. By our method, were mortality not taken into account, if a child had been born and had died within 5 years of the census the mother would be tabulated as a woman of completed fertility if she had no other children under 5 years of age, whereas if the child had lived, the mother would have been counted as a woman of uncompleted fertility. For this reason an "adjustment factor" derived from life table d_x values (7-9) was applied to each group of mothers.

In calculating this adjustment factor, an estimation was made of the number of children born to mothers in each 5-year age group within 5 years of the census and dying before the census was taken. In its actual calculation, the adjustment factor was made a function of both the level of infant and child mortality and of the number of children born to women in each age group. The adjustment does not take into account abortions or stillbirths, although these might have been of some consequence in the duration of childbearing.

Table 2 gives a sample comparison of the difference this adjustment for mortality makes in the proportion of "completed" childbearing in each age group. As with the adjustment for under-enumeration, the largest differences are

at the younger ages. This should be expected because of the higher proportions of younger women who have borne but one child and who therefore have no other child under 5 years of age to put them in the "childbearing uncompleted" category.

From the basic findings shown in table 3, three general facts can be noted: (a) there have been changes since 1910 in the ages at which most women complete childbearing; (b) these changes have been in the direction of a greater concentration of childbearing in certain ages, that is, an earlier average age of women at completion of childbearing and a higher proportion who finish childbearing earlier, and (c) certain demographic developments during the depression decade of the 1930's differed markedly

Table 1. Proportion of all mothers with no children under 5 years of age, adjusted and unadjusted for under-enumeration,¹ by age and race of mother: United States, 1940 and 1910

Age (years)	Native white				Negro			
	1940		1910		1940		1910	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
15-19	19.6	9.4	28.1	18.4	24.6	17.6	35.7	28.5
20-24	14.6	9.7	18.0	14.4	31.2	27.4	33.0	30.0
25-29	29.3	26.9	24.0	22.5	50.6	48.2	43.4	41.6
30-34	50.6	49.6	38.6	37.9	65.1	64.3	53.2	52.3
35-39	69.9	69.2	53.1	52.7	74.2	73.5	60.9	60.4
40-44	84.9	84.5	71.4	71.2	84.3	83.8	74.6	74.2

¹ Figures adjusted and unadjusted for discrepancies in reported childbearing between women who reported on the number of children ever born and women who did not so report.

Table 2. Proportion of all mothers with no children under 5 years of age, unadjusted and adjusted for infant and child mortality,¹ by age and race of mother: United States, 1940 and 1910

Age (years)	Native white				Negro			
	1940		1910		1940		1910	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
15-19	9.4	4.7	18.4	4.8	17.6	10.0	28.5	10.3
20-24	9.7	5.1	14.4	.2	27.4	20.7	30.0	12.2
25-29	26.9	23.5	22.5	9.1	48.2	43.4	41.6	26.8
30-34	49.6	47.0	37.9	27.2	64.3	61.0	52.3	40.1
35-39	69.2	67.6	52.7	44.5	73.5	71.1	60.4	50.3
40-44	84.5	83.7	71.2	66.2	83.8	82.4	74.2	67.6

¹ All figures adjusted for under-enumeration. Those in the "unadjusted" column have only this single adjustment. Those in the "adjusted" column have been adjusted also for infant and child mortality.

Table 3. Proportion¹ of all mothers with no children under 5 years old, by age, race, and residence of mother: United States, 1950, 1940, and 1910

Race and age	Total United States			Urban			Rural nonfarm			Rural farm		
	1950	1940	1910	1950	1940	1910	1950	1940	1910	1950	1940	1910
Total:²												
25-29	18.9	25.6	11.7	19.3	27.8	18.6	19.9	24.7	12.1	16.1	19.4	4.1
30-34	39.8	48.2	28.8	40.0	52.2	39.2	40.8	47.4	28.2	37.6	38.8	16.9
35-39	60.6	67.9	45.2	62.5	73.7	58.3	59.0	66.7	44.0	54.5	54.6	30.4
40-44	81.1	83.5	66.3	83.7	88.4	77.6	79.2	83.1	66.5	72.3	72.6	52.6
45-49	95.5	94.9	88.9	96.7	97.0	93.8	94.6	95.1	89.0	91.3	90.2	85.8
White:³												
25-29	17.4	23.5	9.1	17.1	25.0	14.9	19.0	23.6	8.2	15.6	17.8	2.4
30-34	38.8	47.0	27.2	38.3	50.2	36.8	40.6	46.6	26.4	37.9	38.3	15.4
35-39	60.3	67.6	44.5	61.7	72.9	56.9	59.2	66.6	43.0	55.6	54.9	29.7
40-44	81.2	83.7	66.2	83.4	88.4	76.9	79.5	83.2	66.2	73.4	73.1	52.5
45-49	96.1	95.3	89.6	96.9	97.2	93.9	94.9	95.3	89.7	92.2	91.2	87.3
Nonwhite:												
25-29	34.2	41.3	26.2	38.6	52.4	46.1	30.9	36.6	30.7	19.0	27.6	11.9
30-34	51.4	59.5	39.5	57.5	70.3	59.6	44.0	57.6	38.7	34.8	41.7	24.8
35-39	63.9	70.0	49.7	70.6	79.7	69.9	57.0	67.7	50.4	46.9	53.0	34.2
40-44	80.9	81.9	67.1	86.9	88.4	84.5	76.0	82.2	68.7	64.1	69.6	53.1
45-49	92.2	91.3	84.1	94.5	95.5	93.8	90.9	93.0	84.8	84.8	83.4	76.5

¹ Computed from data adjusted for under-enumeration and for infant and child mortality.

² Nonwhites together with only native whites for 1940 and 1910.

³ Native whites only for 1940 and 1910.

from those which preceded it, and these developments have not been extensively continued since that time.

Among these findings, those for 1940 are somewhat anomalous. On the surface it would seem that the most extensive change in the direction cited was between 1910 and 1940, with a change in the opposite direction between 1940 and 1950. Evidence of a sizable change between 1910 and 1940 can be seen not only in the data under discussion but also in the cohort data collected and analyzed by Whelpton (5).

But whether a change in the opposite direction occurred between 1940 and 1950 is doubtful, in view of the information we have developed from Whelpton's data. By updating his table A for the years through 1954 and then estimating the additional parity-order births which would occur before the end of the period of childbearing, it was possible to make various calculations for cohorts born as recently as 1925. These calculations were used to estimate the ages of the cohorts at the time various proportions of their children either had been born or, for cohorts whose fertility had to be estimated, will have been born.

Obviously, these estimates are subject to error. But since they were made solely for the years near the end of the childbearing period, when but a small proportion of all births occur, even substantial errors should have only a minor effect on the total for cohorts of women born before about 1918. For those born after that date, however, the risk of error in calculations of fertility rates is greater, varying directly with the year of birth.

Despite these limitations, the pattern set by the cohorts for which more data had to be estimated follows quite closely the pattern set by those cohorts for which it was necessary to estimate few or no data. These two sets of data show that, for the cohorts in the childbearing ages in 1940, there had been a generally wider distribution of childbearing in the preceding decade than there had been for cohorts in the childbearing ages in 1950. That is, the period between, for instance, the 25th and 90th percentile births was longer for the cohorts in the childbearing ages in 1940 than for those in the childbearing ages in 1950. This was partly the result of a higher incidence of delayed marriage in the depression years of the 1930's.

If to the fact of delayed marriage we add the fact that our own data are based on the assumption that a mother has completed her childbearing if she has not borne a child for 5 years, it becomes clear that what between 1940 and 1950 appears to be a reversal in the trend toward earlier completion of childbearing may actually be something quite different. Possibly the higher percentages of women who had seemingly completed childbearing by certain ages in 1940 are largely the result of an unusually high proportion of women who, because of conditions during the 1930's, allowed five or even more years to elapse between certain of their births. The increased birth rates for women above age 35 in the late 1930's and early 1940's (10) would lend credence to this view. In short, if anything, the childbearing patterns of women tabulated in the 1940 census represent not so much an advanced stage in the trend toward a shorter period of childbearing as they do a temporary plateau or even reversal of that trend. The important comparisons, then, are those which are to be made between 1910 and 1950, rather than between either of those years and 1940.

Socioeconomic Factors

In considering the relation between childbearing and various socioeconomic classifications we are limited to three variables: race, rural-urban residence, and number of years of schooling.

In comparison with whites, there is a higher proportion of Negro women at either extreme of the childbearing process: on the basis of our definition, a higher proportion of Negro women than of white women complete their childbearing before age 35, while at the same time, a higher proportion also continue to bear children in the later years of the fecund period. Among women of both races, childbearing in the upper ages is most common among those who do not know how to prevent unwanted pregnancies or who are unwilling to accept planning in such a highly personal area of life. This condition, related as it is to low income and scant educational opportunity, is much more common among Negroes than among whites.

On the other hand, the social conditions in which many Negroes have been found to live are likely to lower fertility either through the separation of spouses, which lessens the chance of conception, or for other reasons, such as the contraction of venereal disease, which frequently leads to sterility and pregnancy wastage (11). Many persons who have lived under these conditions may eventually form stable marital relationships; but since fecundity in women declines gradually after about age 25 and more rapidly after about age 30, they may achieve this stability too late for them to bear any, or more than 1 or 2, children.

We have, then, a situation among Negroes in which the ignorance and poverty of a large number has tended to produce a generally longer period of childbearing while at the same time, a considerable amount of personal and social disorganization among others has tended to produce a generally shorter period of childbearing. Our data bear this out by showing, in comparison with whites, a higher proportion of childless Negro women, a higher proportion completing their childbearing in the younger ages, and a higher proportion continuing to bear children in the upper ages. What is unusual about childbearing among Negroes is not the fact that a certain number of women continue to bear children throughout the whole fecund period, whereas others bear only a few or none at all. The unusual character of Negro childbearing derives from the fact that it is dispersed over a wider age range than that of whites.

With respect to rural-urban differences in the proportion of completed fertility, the general trend among white women has been toward less diversity among the three available residential groupings (urban, rural nonfarm, and rural farm) in the proportion of women who have completed childbearing at any given age. The sources of this greater homogeneity are two: (a) a greater proportion of rural women are finishing their childbearing earlier than in the past; and (b) a greater proportion of urban women are finishing their childbearing later.

With the rural areas showing the greater change, the result has been a decrease in the considerable urban-rural differential which

formerly existed. The rural trend is part of a general decline in fertility; the trend in urban areas, however, seems to derive in large part from an increase in births during the "baby boom" after World War II. Were we able to compute the proportions of "completed fertility" on the basis of data for years more recent than 1950, we should probably find among urban women a partial return to the higher percentages of the pre-war years. But it is still likely that the urban-rural differentials will decline further in the future.

Although similar changes for urban and rural groups have occurred among nonwhites, there is not the degree of homogeneity that we find among whites. The differences between residential groupings of nonwhites were smaller in 1950 than in 1910, just as they were among whites. But the changes were considerably smaller among nonwhites than among whites.

Because there is in the United States considerable evidence of a close association between number of years of schooling and socioeconomic status, an analysis of data on childbearing, subdivided according to years of schooling, affords an indication of the differences in timing and duration of childbearing among the various social strata. Such an analysis must be limited to 1940, however, because data for 1910 do not exist, while those for 1950 are in a form unsuited to this kind of analysis.

Our studies show that, among both whites and Negroes, there is greater similarity between rates of completion of childbearing for mothers with the most schooling and for mothers with the least schooling than between the rates for either group and those for women with a grammar or high school education.

The reasons for the similarity in fertility rates between mothers with the most and mothers with the least schooling were quite different, however. Among women with few years of schooling the dominant pattern was one of continual childbearing, even into the upper ages; among women with some college education the pattern was generally one of later marriage. The result, at least in 1940, was a higher proportion of completed fertility at each age among women with some high school education than among the groups with either

less or more than a high school education. But because of generally smaller families, the actual number of years spent in childbearing was less for the groups with more schooling. On the average, the more years of schooling, the fewer years devoted to childbearing.

Demographic Factors

In the present study the causal factors, however numerous and diverse, and however complex their interrelationship, affect the timing and duration of childbearing through only three demographic factors: (a) average size of family; (b) age of mother at birth of first child; and (c) lapse of time between successive births. To the extent that the paucity of data permits any analysis, we have found that not all of these factors have operated in the same direction.

Despite certain tendencies which lengthen the period of childbearing, women today are finishing their childbearing at earlier ages than formerly, first, because of a decline in family size, and second, because of a generally younger age of the mother at birth of the first child.

Median family size has declined considerably since the earlier part of the century, approximately 50 percent for native whites and 60 percent for Negroes (2, 5). In the 1930's this meant a high proportion of childless and one-child families. Today it means a general increase in the proportion of families with 2, 3, and 4 children. In both instances, the change has been characterized by a continual decrease in the proportion of large families, that is, those with six or more children.

With the exception of the depression decade, the average age of the mother at birth of the first child has also decreased considerably since the earlier part of the century, about $1\frac{3}{4}$ years between 1890 and 1950 (12, 13). This is largely the result of an earlier age at first marriage, particularly since 1930.

Although the childbearing period in the United States has been shortened, the available evidence suggests that there has been a tendency in recent years for women to bear children at somewhat longer intervals. This is in keeping with the recommendations of modern obstetricians and is doubtless made possible

largely through the more widespread practice of birth control.

The increased incidence of divorce and the separation of husband and wife because of universal military conscription also apparently act more to lengthen the average period of childbearing than to decrease it through effecting any general decline in the number of children per family. This is partially compensated for to the extent that widowhood in the childbearing ages has declined. But it is our conclusion that the gain in time for childbearing which has resulted from less widowhood has not counteracted the losses occasioned by more divorce, together with separation of spouses in response to universal military conscription. The relative shortness of the 2-year term for draftees and the high remarriage rate for divorcees (14, 15) have apparently resulted, not in a smaller family size, with the attendant possibility of completing childbearing at an earlier age, but simply in postponement or prolongation of the period of childbearing among these groups.

Discussion

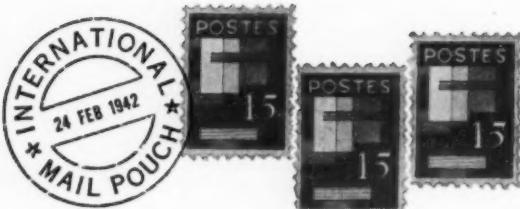
In this brief summary it is not our purpose to discuss the implications of a shortening of the childbearing period among American women or of a change in its timing. Such a fundamental alteration of the basic institution of the family can, of course, have far-reaching effects on various other aspects of the society and its culture. What effects these changes have will depend on the uses to which women put the added years of relative freedom from housework and child care activities.

There is some evidence of an increase in the participation of women in both politics and the labor force. This is particularly true of women from the middle and upper social strata, which may help to explain the publicity it has received in the mass media. To what extent this participation is accounted for by changes in the pattern of childbearing we cannot presently determine. Nor can we at this time do more than speculate concerning the further effects of this participation on such social phenomena as the status of women, patterns of childrearing, and the system of social stratification. But there can be little question that each of these phenomena is at least partially influenced by

the behavior of woman in her fundamental role of wife and mother, and that such behavior is to a considerable extent a function of the timing and duration of her childbearing.

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Pengamats, Mantris, and Controllers

Because Indonesia's malaria control program needed intermediate supervisors, the new position of "pengamat malaria," between the ranks of "mantri" and "controller" was created. Pengamat rank gives technicians, called mantris, an additional opportunity for advancement, as well as providing middle-echelon supervision. The first class for potential pengamats has been started.

The top-ranking supervisors, controllers, are secondary school graduates who are trained in public health and malaria control for 3 years. They then spend 9 months in India, Thailand, or the Philippines in field training and observation of malaria control programs.

Before beginning their work in Indonesia, controllers are given a month's course in public administration to bridge the abrupt psychological change from student to supervisor. The concentrated course covers recordkeeping, personnel practices, job analyses, essentials of supervision, and similar subjects.

—HAROLD A. WOOD, M.D., *chief, Public Health Division, U. S. Operations Mission, Indonesia.*

Filipino Five-Year Plan

Less than a third of the 31 engineers now employed in public health and only a small percentage of the present 2,013 inspectors in the Philippine Department of Health have had specialized training in sanitation. At least 3,400 inspectors are needed. The Philippine government presently has only one sanitary engineer per 700,000 population. The needed engineers may be graduated by the Institute of Hygiene of the University of the Philippines, which granted a master's degree in public health engineering for the first time in 1957.

To prepare inspectors, pilot projects will be launched in two areas selected for both rural and urban characteristics. The projects, demonstrating good sanitary practices in water supply, sewage and

garbage disposal, and rodent control, will be carried out by the training centers where local sanitary engineers and inspectors can gain needed experience.

Three similar pilot projects, requiring a minimum of 5 years to complete, will be set up at other centers. The broad plan for environmental sanitation culminates 2 years of work by local, ICA, and WHO personnel.

—ALBERT P. TALBOYS, *sanitary engineer, U. S. Operations Mission, Philippines.*

Flowers and Privies

In Pedro Pablo Gómez, a village of 232 houses in the coastal area of Ecuador, 217 families paid for their own sanitary pit privies. Privies were installed at the rate of 14 per day.

In nearby Jipijapa, spring floods destroyed the dam which impounded the water for the public supply system. To relieve the emergency, several wells were dug by hand under the supervision of health servicio technicians. School children fenced in small areas around the wells and planted flowers and shrubs to show their appreciation.

—JAMES D. CALDWELL, *chief, health, welfare, and housing field party, U. S. Operations Mission, Ecuador.*

A Phoenix in Reyes

Three years of effort vanished when a vandal lit the fire which destroyed Reyes' newly completed hospital-health center. Fortunately, although servicio's engineering division had finished the two-story cement and wood building in the little Bolivian town, the center's equipment was not yet installed. Only the damaged walls, the sanitary system, and the tiled first floor remained.

Since building the center was the final phase of health facilities construction, Servicio Cooperativo Interamericano de Salud Pública could not assure the town of funds to reconstruct the health center. But Reyes' 2,000 people collected enough money and material to rebuild it on a more modest scale. SCISP is providing technical engineering and administrative assistance.

—HARALD S. FREDERIKSEN, M.D., *chief, health, housing, and welfare field party, U. S. Operations Mission, Bolivia.*

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Previously undiagnosed illness among adults discovered through a survey in East Harlem indicates the need for expanded health education.

Multiphasic Screening Program in a Low Income Area

FANNIE I. TOMSON, M.D., M.P.H.

THE East Harlem Health District, covering an area of 1.6 square miles, lies in the northeastern corner of Manhattan Island. Of its 195,000 inhabitants, about two-thirds have low incomes. About one-half of the population are Puerto Ricans; a small percentage are Negroes.

Within the district are 3 large teaching hospitals with a total capacity of 2,289 beds and extensive outpatient services. All 3 are affiliated with medical schools and all 3 have schools of nursing. Of 408 physicians who have offices in this area, by far the majority are specialists serving the city as a whole, but 105 of them indicated that they are engaged in general practice.

In spite of the accessibility and availability of excellent medical care resources within the district and in the adjacent areas, it has been the impression of the staff at the East Harlem Health Center that the population avails itself of these resources only for emergency care and for acute illness. Unless hospitalization is indicated and made available, treatment is begun in the outpatient service and may never be completed because the patient is too ill to travel to the hospital for continued observation.

It is our impression that the home rarely provides for any medical care. This impression

is based on the broad experience of the health center's staff, gained from more than 128,000 visits by patients each year to our service facilities and the more than 8,000 field visits annually that our nurses make. For example, out of a register of 437 East Harlem residents with active tuberculosis, only 9 are under the care of a private physician.

Lack of care in the home is also evident in the large percentage of the elementary school population of 30,436 for whom the health center provides a school health service. Of 5,560 examinations of these children during the 1955-56 school year, 89.9 percent were done by school physicians of the New York City Department of Health. Except for some service provided by the city's department of welfare for its clients, no agency in the district provides free at-home medical care.

On the basis of the available rates, the East Harlem District falls into the quartile having the highest morbidity and mortality in the city. Measures for early case finding, highly desirable in any area, seem, therefore, to be particularly needed in this district. Children from infancy through high school age get a large measure, if not all, of the preventive services they receive from the child health stations and in the school health program. For adults, preventive services at the health center are limited to its chest, social hygiene, and cancer detection clinics. The hospitals provide little, if any, of this type of service.

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In order to assay the situation to some degree, the East Harlem Health Center conducted a series of three multiphasic screening programs on three evenings in the spring of 1956. On the basis of an estimated capacity for 200 screenings an evening, we set a goal of 600 patients. Our health education campaign for 3½ months preceding the first screening night included letters to all suitable community agencies and organizations, press releases in English and Spanish, and, on request, speakers for scheduled meetings. Posters were distributed throughout the area. The staff of the center was asked to refer East Harlem adults who were not already patients at one of the three clinics.

It is noteworthy that 306 of the 435 patients (70 percent) were referred to the center by a parent-teacher association from a single school in the area. This parents' group from a school with 1,633 students, 95 percent of them Puerto Rican, was active in spreading information about the survey and in urging members to participate. This group received a good orientation on what to expect on the screening nights and on the course of the subsequent followup.

Methods and Criteria

At the screening sessions a total of 435 persons were examined. A maximum number of nine diagnostic procedures were available to a patient. Only 16 persons had all 9 tests, and only 10 persons had fewer than 5. The average number per patient was 6.

The patients were weighed and measured, and a panel of physicians checked their skin, mouth, eyes, and mucous membranes, and gave them a quick nutrition evaluation.

Chest X-rays were taken on 70-mm. film, following the standard procedure set up by the New York City Health Department's bureau of tuberculosis. Persons with unsatisfactory or suspicious X-rays were recalled for a standard 14" by 17" X-ray and followup in the chest clinic. Cardiac pathology was picked up by the same service.

Blood specimens were drawn for serologic and blood sugar tests. The Mazzini test was used to screen for syphilis in accordance with the standard procedure of the health department's bureau of preventable diseases. The Kolmer and VDRL tests were done on positive

reactors. If these tests were positive, the person was recalled to the social hygiene clinic for a history and a physical examination as well as a repeat serologic test.

Tubes containing potassium fluoride were used in the blood sugar test. The time of the last meal was obtained. Since the screenings were held in the evening, the tubes were refrigerated overnight and analyzed the following morning in the laboratory of the diabetes detection clinic of the Brownsville Health Center. These criteria, used by the diabetes detection clinic, were followed:

	Screening level for blood sugar (mg.)
Hours since last meal	
Less than 2-----	130
2 to 3-----	110
More than 3-----	100
Not known-----	130

Self-obtained Papanicolaou smears were submitted by the women. These were stained and examined in the cancer detection clinic according to the standard procedure set up by the city's Adult Hygiene Bureau.

Physicians took the blood pressures. We set up this guide for recalls:

	Systolic mm. Hg.	Diastolic mm. Hg.
Age of patient		
Under 30-----	130	90
30-39-----	140	90
40-49-----	150	90
50 or over-----	150	100

On recall, persons were retested by physicians in the center's clinics or by the district health officer. When high readings persisted for those with suggestive history or symptoms, the patients were referred to treatment agencies.

For the eye tests, an ophthalmologist was provided to the survey by the glaucoma research division of the New York Association for the Blind. The ophthalmologist used the Berens-Tolman hypertension indicator, which picks up tension of 25 mm. Hg. or more. Individuals with this reading were recalled for a history and referred to a treatment agency. In addition to glaucoma, the ophthalmologist reported a number of other eye conditions which he incidentally diagnosed.

The National Society for Prevention of

Blindness supplied technicians to conduct near vision tests. They used the Lebohson chart at a distance of 14 inches. Patients with a visual acuity of less than 14/21 with or without their glasses were referred for followup. The technicians also carried out field vision tests using the Harrington-Flocks multiple pattern field screener.

Since our regular health department services supplied most of the staff, all of the supplies, the laboratory work, and the followup and voluntary agencies provided the staff for the eye examinations without charge, the cost of the screening evenings is impossible to estimate with any degree of accuracy.

Survey Findings and Followup

All but 33 of those screened were East Harlem residents. Although the survey was especially scheduled in the evening for the convenience of working people, only 114 of the participants were men. Nearly 70 percent (303) were Puerto Ricans; 7 percent (31) were Negroes.

There was a wide age range, but 354 persons were 20-49 years of age because such a large percentage of the screened population came from the parents' group. Five were under 20, and 10 were 70 or older. During the followup we learned that of the 286 persons who gave data on their incomes, 250 claimed a weekly per capita income of less than \$20. The median, excluding 37 cases on welfare, was \$12.24. The average family had 4 or 5 members.

A relatively high percentage of positive findings were expected in this population, but the results far exceeded expectations (table 1). The survey found 525 defects in 312 of the persons examined. Only 123 were completely negative, and this fact was reported to the screenee's private physician, if he had named one, or the screenee was notified by mail (table 2). Relatively serious defects, previously unknown to the participants, were found in 131 (30 percent) of the screened group (table 3).

None of the 312 found to have one or more defects received this information by mail. The findings were reported to a private physician, if his name had been given, or the person was given an appointment at the health center. If any of the defects fell in the area of any one of the health center services, which include chest,

social hygiene, and cancer detection, the patient was recalled by the clinic, advised about all of the positive findings, and referred for treatment.

Table 1. Defects discovered through multiphasic screening of adults in East Harlem, 1956

Test	Total persons screened	Num- ber of persons with acceptable examination or laboratory specimen	Num- ber of defects ¹	Per- centage of defects ²
Chest X-ray:				
Lung-----	435	428	10	2.3
Heart-----	435	428	13	3.0
Papanicolaou smear-----	261	212	2	.9
Serology-----	423	420	15	3.6
Blood sugar-----	420	375	50	13.3
Nutrition examination (includes obesity)-----	431	431	249	57.7
Tonometry-----	186	186	7	3.8
Eye inspection-----	186	186	5	2.7
Field vision-----	46	46	5	10.8
Near vision-----	128	128	89	69.5
Blood pressure-----	432	432	80	18.5
Total-----	435	-----	525	-----

¹ Defects were found in 312 persons.

² Percentage of defects compared with number of persons with acceptable examination or laboratory specimen.

Table 2. Persons with no defects found during multiphasic screening of adults in East Harlem, 1956

Age group (years)	Total number of persons tested	Persons without defects	
		Number	Percent
Under 20-----	5	1	20
20-29-----	100	40	40
30-39-----	142	52	36
40-49-----	112	23	20
50-59-----	33	2	6
60-69-----	32	2	6
70 and over-----	10	2	20
Not stated-----	1	1	100
Total-----	435	123	28

Table 3. Significant defects, previously unknown, diagnosed for the first time in 131 adults through a multiphasic screening in East Harlem, 1956

Defect or disease	Total persons screened	Number of persons with acceptable examination or laboratory specimen	Number of defects diagnosed ¹
Active tuberculosis ²	435	428	2
Cardiac abnormality ² (by X-ray)	435	428	8
Cervical cancer ²	261	212	1
Syphilis ²	423	420	6
Hyperglycemia	420	375	38
Nutritional defect (not obesity)	431	431	41
Field vision defect	46	46	3
Near vision defect	128	128	21
Glaucoma	186	186	5
Other eye condition	186	186	2
Hypertension	432	432	46
Total	435	-----	173

¹ This does not include persons who needed referral for further treatment for a known pathologic condition such as cancer of the cervix, and who needed further persuasion to accept supervision and care.

² Indicates conditions in which the diagnosis was confirmed on followup. For all other conditions the persons were referred directly to treatment agencies.

Patients whose defects fell in a category for which the health center had no clinic service received an interview with the health officer and conference nurse. Previous knowledge of the condition and treatment status was determined and referral for further followup was made on the basis of need.

On the screening night, only 58 persons gave the name of a private physician to whom we could report the findings. In subsequent interviews of 358 persons during clinic followups or home visits, sometimes both, 117, or one-third, indicated that they had a doctor to whom the family at least occasionally went for treatment. Forty-four percent (156) used 1 of the 3 hospitals in the district, the majority, 117, the municipal hospital; 26 gave the name of a hospital outside of the district; and 59 said the family knew no treatment agency.

Some of the district's difficulties in followup can be gauged from the fact that the mail was returned "not found" for 24 patients. Most of these were traced by 2 medical students who

made home visits in July and August, but 9 were never located. What seems especially remarkable is that, although the patients spent several hours undergoing examination on the survey nights, not more than a handful came in or called up to inquire about the results.

During the summer of 1956, two 3d-year medical students visited the homes of 226 of the individuals who had participated in the program. Thus further information was obtained about the patients' previous awareness of pathology, current treatment status, other illnesses, treatment agencies used, family income, and number in the family. Language difficulties, evasiveness, and sometimes the obvious fact that the person interviewed did not know the answer to a question made some visits unsatisfactory, and we felt that statistical evaluation could not be applied to the answers. Only 125 visits were satisfactory and gave us valuable information otherwise not obtainable.

Summary and Conclusions

In the spring of 1956, three evening multiphasic screening sessions with nine tests available were held in the East Harlem Health Center. Of 435 individuals participating, all but 33 were residents of the district. Only 123 persons did not require recall. A total of 525 defects were found in 312 persons; 131 of these had relatively significant pathology of which they had no prior knowledge.

The findings of this survey suggest the incidence of a high degree of undiagnosed illness in the low-income, adult population of the district. Further investigation is needed to determine the size of the problem in this and other population groups. This type of investigation should be particularly rewarding because so many of the illnesses and defects found in the survey lend themselves to amelioration and cure.

Consideration should be given to the extent and manner in which the community should make available expanded facilities for diagnosis and followup. Perhaps of greatest importance is the need for health education designed to increase the individual's awareness of the existing services and facilities and to raise his standards for positive health.

In a recently established research program, the National Office of Vital Statistics is developing sampling survey methods and conducting studies to collect supplementary data "anchored to vital records."

Expanding and Improving Vital Statistics

MONROE G. SIRKEN, Ph.D., and HALBERT L. DUNN, M.D.

VITAL STATISTICIANS generally think of their program as consisting of two related parts, registration and statistics. Traditionally, "statistics" has meant tabulation of data derived routinely from registration certificates. These tabulations may be considered basic vital statistics. To meet a growing demand for additional data, the concept of vital statistics is being expanded to cover supplementary statistics anchored to the vital records.

The increasing demand for supplementary vital statistics is not difficult to understand. Vital events are crucial in people's lives, and consequently they are central to many other events. Economists, demographers, and social scientists are among the host of nonhealth users of basic and supplementary vital statistics. In public health, the demand for supplementary vital data has been stimulated by the growing concern with chronic diseases, which has created interest in studies that relate the person to his total environment.

The demands for more vital and related statistics presently exceed our ability to supply them. With a few notable exceptions, such as

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tabulations of multiple causes of deaths, we have pretty well exploited the items on the vital records. We do not mean to imply that all possible applications are being made of our tabulations of basic vital statistics; this is not the case. We mean merely that there is little possibility of developing tabulations of vital statistics involving new variables from the data now provided on the vital records.

How, then, should we proceed in developing new vital statistics as needs materialize? It is natural to think first of the possibility of adding new items to the vital records, but the prospects here are not encouraging. The records are legal as well as statistical documents; they cannot be encumbered with what the legal mind regards as extraneous. In fact, vital statisticians themselves would be reluctant to add too many new items or certain items. If we should ask the physician, the hospital staff, or the funeral director to provide routinely a lot of supplementary information, the request might endanger the quality of the basic data they are now providing. Furthermore, the possibility of getting more vital data by revising the vital records is not good because our system binds us to infrequent revisions.

Even if we could overcome these difficulties, we would find it inefficient routinely to collect supplementary information on the vital record itself because it is rarely necessary to obtain such information for every vital event, be it birth, death, marriage, or divorce. Because of the sampling errors that can be tolerated,

the collection of supplementary information can usually be confined to a relatively small subsample of the appropriate events occurring in a specified time period. In most studies, supplementary information is applicable only to a subset of events such as deaths due to selected causes or births of specified weights. Moreover, the information is needed for a single year or less or on a cyclical basis less frequently than annually.

The kinds of supplementary vital statistics that are being requested can be grouped according to their uses into three main categories. One, supplementary vital statistics are of administrative value in planning or evaluating a program, say statistics on the circumstances of fatal accidents in planning an accident prevention program. Two, such data are used in epidemiological studies to search for the etiological determinants of disease; for example, to relate cancer to cigarette smoking or fetal deaths to radiation exposure of the parents. Three, in population studies they are used in combination with information collected from other sources to get an accurate picture of what is going on in the general population. Thus, data on hospital utilization by persons who die during the study period are combined with comparable information collected from household surveys to get unbiased estimates of total hospital utilization for the exposed population.

The foregoing exemplify types of supplementary statistics related primarily to expanding the scope of vital statistics. Another important use of supplementary data is to evaluate and improve the quality of vital statistics. For example, inquiries are being made into the diagnostic evidence on which medical certification of death is based. In another study, the concept of usual place of residence as applied to tabulations of mortality statistics is being evaluated on the basis of supplementary information covering the lifetime residences of the decedent.

Since the lack of knowledge concerning methods of collecting supplementary data is probably the chief deterrent to expansion and improvement of vital statistics, the National Office of Vital Statistics of the Public Health Service has recently initiated research on

sampling survey methods as applied to this field. It is hoped that the continuity of research assured by this new activity will contribute to the development of appropriate methods and stimulate interest in others to do likewise.

Record-Anchored Studies

NOVS feels that studies anchored to the vital records hold the most promise of success in getting the needed supplementary data.

What is meant by "studies anchored to vital records"? These are studies in which the universe is defined by registered vital events. The records of appropriate vital events are the basic units, and supplementary information is collected for a sample of these units. Three main types of studies anchored to vital records are (a) the retrospective, or followback, study, (b) the cohort study, and (c) the record-matching study. In followback and cohort studies, supplementary data are collected by conducting surveys. The followback study is based on information collected in a single survey, whereas the cohort study entails collecting information for an identical set of persons on two or more occasions. In the record-matching study, the death certificate or other vital record of a person is matched with his other records, such as the census enumeration or OASI record.

The record-anchored method of collecting supplementary vital statistics has several good features. First, complete files of vital records are available for the Nation, for each State, and for communities; from these, all cases of rare vital events and probability samples of less unusual events can be readily selected. Second, basic facts concerning the vital event are contained in the vital record and therefore need not be collected again. Third, the established vital statistics system provides an operating organization for conducting these studies.

According to NOVS experience, studies anchored to the vital records are generally problem oriented. The data are usually collected for specific purposes such as estimating the amount and kind of hospital care given to persons during the year before death or testing hypotheses associating respiratory cancer with cigarette smoking. Consequently, the survey design is tailor-made, as are the decisions regard-

ing the size of the sample, the type of questionnaire and kinds of questions, and the sources queried for information. As has been indicated, each of these surveys is usually of short duration. However, the possibility of establishing a continuous sampling procedure for conducting retrospective and cohort studies to collect certain kinds of supplementary information routinely and other kinds on a one-time or cyclical basis deserves consideration.

This brings us to consideration of the question, what are the most efficient ways of conducting the record-anchored studies to collect the needed data? An answer to this question requires consideration of costs and of sampling and response errors associated with collection of the information.

During the past year, NOVS has been developing optimum procedures for conducting retrospective studies anchored to the death certificate. The first methodological study, the Pennsylvania mortality study, tested procedures for collecting supplementary information about decedents by the retrospective method (1).

Data Collection Procedures

The Pennsylvania mortality study was sponsored by NOVS and the National Cancer Institute, Public Health Service, in cooperation with the Pennsylvania Department of Health. Undertaken primarily to determine procedures for conducting retrospective studies of decedents, it also served as a pilot test for an epidemiological lung cancer study in which smoking and residence histories were to be collected retrospectively for a nationwide sample of deaths. Physicians were requested to supply information about the diagnostic procedures on which they had based their certification of the causes of death. Relatives or close friends were asked to supply information about the smoking habits, residence, and job histories of the deceased.

More than 1,700 deaths were selected from those registered with the Pennsylvania Department of Health during May, June, and July 1956. Included were all lung cancer deaths, about 600, occurring during the 3-month period; for these the Pennsylvania Department of

Health provided copies of the death records. The remainder were a sample of the deaths from other causes selected at NOVS from Pennsylvania's monthly shipment of death certificates in the 10 percent current mortality sample. (The current mortality sample is a 10 percent systematic sample of death certificates received each month in the vital statistics offices of the 48 States, the District of Columbia, and 3 independent registration cities—Baltimore, New Orleans, and New York.* Each month, the vital statistics offices send copies of the death certificates in the sample to NOVS.)

Collection of data for each death began with a mail query to the funeral director requesting the name and address of the certifying physician or for identification of the family informant if this information was missing, incomplete, or illegible on the death certificate. Next, the medical certifier of each death was sent a query by regular mail. Followup letters by regular and then by certified mail and telephone reminders for nonresponding physicians were the subsequent steps.

The original query to the certifying physician stated that the family informant would be asked for supplementary information about the decedent unless the certifier advised against it. Such advice was given rarely, and relatives or friends of virtually all decedents were queried. The survey of informants was initiated with a regular mail query, and followup actions included both regular and certified mailings. Personal interviews were conducted on a subsample of nonrespondents who lived in standard metropolitan areas.

Unusually high response rates in the Pennsylvania mortality study indicate the feasibility of collecting data by means of retrospective studies anchored to the death records. More than 95 percent of the certifying physicians eventually answered the queries. More than 85 percent of the family informants answered the mail queries, and the response rate was increased to 95 percent by means of the personal interview.

Another phase of the study, not yet completed, consisted of personal interviews with a random subsample of about 300 family informants living in standard metropolitan areas who had answered the mail queries. The purpose of these interviews was to measure the quality of infor-

mation reported by mail by comparing it with responses given in the personal interviews.

Other NOVS Objectives

In addition to the activities related directly to basic methodological research, two other objectives of special interest are included in NOVS's program for supplementing vital statistics. First, NOVS hopes to establish a service to provide technical consulting assistance on these matters to other agencies, including State and local health departments. Second, a survey-operations unit has been established for conducting survey studies to supplement and improve vital statistics. NOVS, in collaboration with other agencies, is currently undertaking one such survey and is planning another for 1958. The first, a joint project with the National Health Survey Program, is an illness study of deceased persons in the Middle Atlantic States. The second, which NOVS is undertaking for the National Cancer Institute, is a national lung cancer mortality study based on lessons learned from the Pennsylvania mortality study.

The national lung cancer study will use for the first time a procedure that may be called dual sampling. Corresponding data will be collected for a sample of vital events and for a sample of the exposed population in order to obtain estimates of vital rates. The national lung cancer mortality study will comprise one phase of a national lung cancer study that includes collecting information on smoking habits and residence history for both a national sample of lung cancer deaths and a sample of the national population. The information for a sample of the national population will be collected by the Bureau of the Census as a supplement to its current population survey. National estimates of lung cancer mortality rates in association with smoking habits and places of lifetime residence will be derived from ratios of the two sets of data.

NOVS will need the assistance and cooperation of State health departments in conducting national studies anchored to the vital records. What we have in mind is the kind of relationship that NOVS had with the Pennsylvania Department of Health in the Pennsylvania mor-

tality study. Most important was the fact that the State health officer endorsed the study. Also important was his assistance and that of his associates in the health department in obtaining the endorsement of the State medical society.

The national lung cancer mortality study will entail following back on a relatively small number of lung cancer deaths selected from the death records sent to NOVS in the 10 percent mortality sample. The study has been endorsed by the Association of State and Territorial Health Officers. However, it cannot be completely successful without the approval of health departments in the 52 independent registration areas in the continental United States. We feel confident of Federal-State co-operation in this study in view of the long-standing cooperative relationships between NOVS and State offices of vital statistics.

Conclusions

At the beginning of this paper, we spoke of three activities of vital statistics programs: registration, production of basic vital statistics, and production of supplementary vital statistics. We believe that there will be a considerable increase in the research use of vital records at the local, State, and national levels, particularly as the records serve as focal points in sample surveys to collect supplementary vital statistics. Consequently, the activities of vital statisticians in this area will increase. It will be important, however, to continue to pay close attention to the other activities as well. Survey studies anchored to vital records may be visualized as the superstructure of the vital statistics system. Registration practices and the compilation of basic statistics are the foundation. Of necessity, the foundation must be kept in good repair in order to serve the needs for continuous series of the basic statistics and to support the supplementary statistics.

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KB cells, easy to obtain and inexpensive to grow in tissue cultures, were used as successfully as monkey kidney cells for the isolation and identification of polioviruses.

Tissue Cultures of KB Epithelial Cells for Poliomyelitis Virus Tests

LAURI LUOTO, D.V.M., M.P.H., and EDGAR G. PICKENS

PUBLIC HEALTH laboratories are often called upon to test various human specimens for polioviruses. A variety of human and monkey cell cultures are employed (1) for this purpose, but their use presents certain limitations for small laboratories operating on limited budgets or those at some distance from biologic supply firms. The use of such cells requires ready access to a source of materials and may prove expensive. The cultivation of certain cells, such as the HeLa cell, by serial passage, has proved troublesome at the Rocky Mountain Laboratory and other laboratories. Utilization of a cell line that can be more easily grown by serial passage, such as the epidermoid carcinoma, strain KB (2), which is susceptible to poliovirus (3), offers advantages of availability, economy, and convenience.

This paper describes a method for growing KB cells serially in tissue cultures and the results obtained in tests for the isolation and identification of polioviruses.

Material and Methods

KB cells grown and maintained as stock cultures in square 16-ounce bottles were transplanted to smaller containers for test purposes. Stock bottles seeded with 3 ml. of a cell suspension (approximately 3,600,000 cells) and 14 ml. of growth medium yielded confluent sheets of closely packed cells suitable for transplant-

ing after 7 days' incubation at 36° C. These cells were trypsinized, centrifuged at 600 rpm for 10 minutes, and resuspended in a volume of medium 8 times that of the original cell inoculum. Thus, each stock bottle yielded 24 ml. (8 x 3 ml.) of transferable cell suspension. For use in tests, 2-ounce prescription bottles were inoculated with 0.5 ml. (600,000 cells) of the cell suspension and 10 ml. of medium. When test tube cultures were prepared, each tube received 1 ml. of the suspension diluted 1:20 in medium (60,000 cells).

Growth medium, 90L, for the KB cells consisted of Scherer's maintenance solution (4) containing 0.5 percent lactalbumin hydrolysate, 10 percent horse serum, and 125 units each of penicillin and streptomycin per milliliter. Cultures were ready for use after 3 days of incubation when bottles contained scattered islands of proliferating cells and tubes contained nearly confluent sheets of cells. Prior to inoculation with test specimens, the growth medium was replaced with medium 95M which consisted of 90L diluted with an equal volume of maintenance solution. To avoid heavy growth and

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consequent overcrowding of cells, test cultures were used within a few days. Stock cultures of KB cells could be stored for several weeks at 28° C.

Cultures also were prepared from trypsinized rhesus monkey kidneys (5). MK cells were planted in 2-ounce or 16-ounce bottles, or in test tubes, in Hanks' solution (6) containing 0.5 percent lactalbumin and 5 percent horse serum. This medium was replaced after 5 days incubation with a similar one containing 5 percent calf serum instead of horse serum, and an additional 20 ml. 4.4 percent NaHCO₃ per liter of medium. Before using the cultures, when grown to yield confluent sheets of cells after 7 to 10 days of incubation, the latter medium was replaced with a similar one containing only 2 percent calf serum but an additional 20 ml. NaHCO₃.

Prototype and types 1, 2, and 3 polioviruses were titrated in tube cultures of KB and of monkey kidney cells. One-tenth milliliter aliquots of tenfold dilutions of virus were inoculated into 6 tubes per dilution and the cultures were observed for 7 days for virus-induced cytopathogenic changes. Titers of virus obtained with the respective cells were calculated (7) from the highest dilutions which produced cellular changes.

Neutralization tests for identification and typing of polioviruses were performed (5) in both cell cultures with poliomyelitis antisera from hyperimmunized monkeys. Neutralization of virus activity by pooled or by type-specific antiserum within the 4-day observation period was the basis upon which agents were identified as poliovirus or a type thereof.

Isolation of polioviruses from human specimens was attempted with both KB and monkey kidney cell cultures. Human fecal specimens were prepared as 20 percent suspensions in saline and centrifuged at 8,000 rpm for 30 minutes. Supernates, to which 125 units each of penicillin and streptomycin per milliliter had been added, were inoculated in 0.4-ml. amounts onto cultures. Throat washings, collected in 20 ml. of 1 percent bovine albumin in Hanks' solution with antibiotics, were inoculated in 1 ml. amounts. Daily for 7 days, cultures were examined microscopically for cytopathogenic changes; changes observed in

second passage cultures were considered specific. Viruses in such culture fluids were then differentiated in poliomyelitis-neutralization tests. If a discrepancy occurred in the test results between the MK and KB cultures, the test specimens were retested in cultures of both cells. Data on original tests of most specimens on monkey kidney cells were obtained through Dr. Carl L. Larson and William Wicht, Rocky Mountain Laboratory.

Results

Results of titrations of 9 suspensions, representative of 3 types of virus, indicated that both tissue-culture systems were of approximately equal sensitivity for the detection of polioviruses (see table). In tests of virus dilutions

Titers of polioviruses obtained in cultures of MK cells and KB cells

Poliovirus	Virus titer ¹	
	MK cells	KB cells
<i>Stock strains</i>		
Type 1:		
Mahoney	10 ^{-6.6}	10 ^{-6.6}
Brunhilde	10 ^{-6.4}	10 ^{-6.7}
Type 2:		
MEF	10 ^{-6.5}	10 ^{-6.0}
Lansing	10 ^{-6.3}	10 ^{-6.4}
Type 3:		
Saukett	10 ^{-7.0}	10 ^{-6.4}
Leon	10 ^{-6.8}	10 ^{-6.7}
<i>Recent isolates</i>		
Type 1: No. 3420	10 ^{-6.8}	10 ^{-7.0}
Type 2: No. 2682	10 ^{-6.7}	10 ^{-6.8}
Type 3: No. 2647	10 ^{-6.7}	10 ^{-5.6}

¹ Log of TCID₅₀/ml.

near the end point, changes were sometimes noted earlier in monkey kidney cells than in KB cells, possibly because the irregular shape of the former cell permitted easier detection of changes. Differences noted were not significant, however, since cellular changes were essentially identical within several days. Alterations induced in KB cultures were similar to the progressive changes observed in monkey kidney cultures. Individual cells rounded into refrac-

tile spheres which detached from the glass surface until the entire culture was destroyed.

Eighteen known polioviruses, 3 prototype and 15 recent isolates, previously identified in monkey kidney cultures as types 1, 2, or 3, were retested in KB cells with type-specific and pooled antisera. In every instance type-specific and pooled antisera caused clear-cut neutralization of virus. Results of these tests were identical with those previously obtained with monkey kidney cultures.

Identification of 80 recently isolated viruses of mixed species was attempted by neutralization tests in which only pooled poliomyelitis antisera were used. Thirteen agents were identified as polioviruses with both MK and KB cells. The remaining 67 viruses were not inactivated by the antisera when tested in either cell type. Apparently KB cells are as effective as monkey kidney cells for identification of polioviruses inasmuch as all 13 known polioviruses and 67 nonpolioviruses, subjected to tests in both cells, were accurately differentiated with KB cultures.

Approximately 300 suspensions of feces or throat washings were tested for the presence of cytopathogenic agents. Viruses were detected in 29 specimens when monkey kidney cells were used and in 62 specimens when KB cells were employed. Of the agents isolated, 22 in monkey kidney cultures and 24 in KB cells were polioviruses. These isolations were made from the same specimens except in the two instances where cytopathogenic effects appeared only in KB cells.

Agents other than polioviruses were detected in 38 specimens tested with KB cultures and in 7 of the same specimens with monkey kidney cells. Thus, the KB cells detected all polioviruses or other viruses that were isolated from human specimens with MK cultures.

Discussion

KB cell cultures used for the isolation or propagation of viruses should consist of a dispersed cell pattern so that cellular changes caused by virus can be detected readily. Cultures containing heavier growth or confluent cells can be used with polioviruses, which produce rapid and complete degeneration of cells.

When viruses that are slow growing or that produce minimal cytopathogenic changes are cultured, the use of confluent cells may result in overcrowding and loss of cell detail, interfering with the detection of changes if tests are to be held longer than a week. Suitable cultures are easily prepared and quickly available if containers are inoculated with appropriate numbers of cells.

The sensitivity of KB cells to polioviruses, as demonstrated in titrations, in neutralization tests, and in isolation of the virus from naturally infected specimens, indicates that this cell may be substituted for or used to supplement MK cultures now used for these purposes. Also, KB cells appear more susceptible than monkey kidney cells to many nonpolioviruses. This observation will be considered fully in another paper.

Summary

Cultures of KB cells were as sensitive as cultures of monkey kidney cells in titrations of 9 suspensions of polioviruses representative of the 3 antigenic types. Eighteen known polioviruses were accurately identified by neutralization tests with KB cells. When 80 unidentified viruses were subjected to neutralization tests with poliomyelitis antisera, 13 polioviruses detected by monkey kidney cells were also identified by KB cells. In tests of 300 human-fecal suspensions or throat washings, 22 polioviruses detected in cultures of MK cells were also isolated in KB cells. Since cultures of KB cells can be propagated serially, they are less expensive and more readily available than monkey kidney cells commonly used for the isolation and identification of polioviruses.

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State Mental Health Legislation in 1957

Broad expansion of community mental health services took place during 1957 as a result of the large volume of State legislation aimed at stimulating mental health programs in the communities and at improving conditions for the mentally ill.

During that year, according to reports received by the National Institute of Mental Health, Public Health Service, California, Minnesota, New Jersey, and Vermont passed laws providing grants-in-aid for community mental health services. Such legislation had been passed by Connecticut, New York, Pennsylvania, Indiana, Tennessee, and Florida in previous years.

Laws authorizing counties to levy taxes or to appropriate funds to support local mental health centers were passed by Iowa, Kansas, and South Dakota in 1957.

States and Territories which took steps to modernize laws governing commitment, detention, care, and treatment of the mentally ill were California, Colorado, Kansas, Minnesota, Montana, North Dakota, Texas, and Alaska.

Legislative action in Connecticut, Maine, Minnesota, New Hampshire, Oregon, Rhode Island, and West Virginia ratified the Interstate Compact on Mental Health, already subscribed to by Massachusetts, New York, and New Jersey. For care and treatment of the mentally retarded, Arkansas, Nebraska, and Texas authorized the construction of new institutions, the State of Washington set up a diagnostic and training center, and New York is planning a research institution. Idaho and Minnesota made it mandatory for local school districts to provide instruction for such handicapped children.

In Washington, a resident treatment center for emotionally disturbed children is being set up for research and treatment and a center for such children has also been authorized in Minnesota.

For juvenile delinquents, a special program of intensive treatment in California is being initiated in two institutions of that State. Among the States taking action to expand research and training were Texas, North Dakota, Iowa, and Ohio, where a research program in alcoholism was set up at the College of Medicine of the Ohio State University.

National Food Conference

Neglect of breakfast was observed to be the main cause of poor nutrition by several speakers at the National Food Conference in Washington, D. C., on February 24, 1958. Fears and discomfort were also discussed as major causes of poor feeding habits.

Almost every age group and both sexes consume inadequate amounts of nutrients, several of the speakers stated. High on the list of ill-fed, however, were teen-age girls and women 30 years of age or older, including many who fear the cosmetic effects of fat.

Adelia M. Beeuwkes, associate professor of public health nutrition at the University of Michigan, pointed out that teen-agers in every section of the country are failing to eat all the nutrients recommended for good health. She said there is a vital need for a nutrition education foundation in order that industry can present to the public a coordinated effort relating to all the foods necessary for normal nutrition.

Elmo Roper, market research consultant, observing the same conditions as Professor Beeuwkes, said that a large number of teen-age girls, apparently emulating their mothers, either skip breakfast or fail to eat a balanced one. "Part of the answer," Roper said, "lies in fear of weight. Part seems to lie in circumstances surrounding the eating of breakfast. Eating alone, eating in a hurry, a poor night's sleep, for example, all work against eating a good breakfast."

The older females get, the more they lean to poor diets, observed James H. Hilton, president of Iowa State College. Only 27 percent of girls 6-8 years old do not have a proper diet, but 89 percent of women 30 years old and older are not eating well.

Referring to a study of 681,000 women in Iowa who were 30 years old or older, Hilton said that "the diets of one-half to two-thirds of the

women were lacking in calcium, ascorbic acid, or vitamin A. About one-third of the diets were deficient in protein."

Deficiencies of this kind in the diet, Hilton added, might account, at least in part, for such things as fatigue and emotional instability of which the women in the study complained.

Roper provided additional information on women between 21 and 30 years of age. In a survey, a sample of these young women were asked to list everything they had eaten in one day. Their answers were classified according to the Department of Agriculture's basic 7 groupings. Only 3 percent of the women met the recommended requirements.

Hilton and Roper were in accord that the public must be educated in good eating habits rather than in the nutritive values of food. The failure in this country, Roper said, is not the supply of proper foods or the money to buy them. Nor is the public "unsympathetic to the objectives of proper eating." The public has simply failed to act upon its knowledge.

Hilton and Roper also emphasized the importance of continuing nutritional research. The effects of the working mother on the family diet, the uncongeniality and hastiness of meal-times, and the rapid changes in the preparation of food must be taken into account, Hilton said, along with the "ethnic, environmental, economic, and social origin of the people," in nutritional research.

Miriam E. Lowenberg, head of the foods and nutrition department of Pennsylvania State University, observed that children can be fed better and more wisely if they are viewed as individuals with certain capacities and preferences.

Practical considerations, she said, should guide us in the proper feeding of children. Some of the considerations she discussed were:

A 2-year-old child is able to eat approximately two tablespoonfuls of most vegetables and meat and twice that amount of soup or dessert. One should therefore avoid giving him adult portions.

If a child is served less food than he can actually eat, he feels successful when he has eaten everything set before him and he may even ask for more.

Mothers should select food that youngsters can pick up. They should allow children to eat with their fingers, she said, so that the child need not feel insecure because of awkwardness with fork and spoon.

Children prefer simple dishes and mild flavors, Dr. Lowenberg added. They have no desire to try new foods or strong seasonings.

Children 2 to 6 years old are sensitive to the texture of foods, prefer crispy foods, such as raw vegetables. They seem to enjoy the noise of chewing, she said. They dislike gummy textures or very dry food. Children under 7 do not particularly enjoy food that they have to slice, for they cannot easily use the knife.

If practical considerations are followed, Lowenberg concluded, satisfying eating habits can be instilled in the healthy child.

films

Aedes aegypti Survey Techniques

35-mm. slide film, color, silent, 82 frames, 1957.

Audience: State, county, and local mosquito control personnel.

This film documents techniques and procedures used in a population survey of *Aedes aegypti*, vector of yellow fever and dengue.

The frames show (a) orientation and briefing of mosquito control personnel before the survey; (b) selec-



tion of areas to be sampled; (c) types of equipment used; (d) various habitats of the mosquito; and (e) larvae sampling and methods of collecting adult mosquitoes.

The print may be obtained on short-term loan (United States only) from the Communicable Disease Center, Public Health Service, 50 7th Street NE, Atlanta 5, Ga., or by purchase from United World Films, Inc., 1445 Park Avenue, New York 29, N. Y.

Communicable Disease Center, Public Health Service, 50 7th Street, NE, Atlanta 5, Ga., and by purchase from United World Films, Inc., 1445 Park Avenue, New York 29, N. Y.

Collection and Shipment Of Insects

35-mm. filmstrip, color, sound, 9½ minutes, 70 frames, 1957.

Audience: Students of biology, sanitarians, and pest control operators.



This filmstrip shows the correct methods of collecting, preserving, and shipping insects and certain other arthropods to be identified by specialists. These techniques include methods of pinning and labeling, with pertinent data, and packing for shipment.

The film is available on short-term loan, United States only, from the

Engineering Your Health

16-mm. film, color, sound, 13½ minutes, 1958.

Audience: Freshman and sophomore college students, junior and senior high school students, science teachers, vocational guidance counselors, PTA groups, civic clubs, and television viewers.

Looking forward to emerging and expanding responsibilities, this film describes the problems, the needs, and the research and operational aspects of the Division of Sanitary Engineering Services programs in water pollution control and water resources, atmospheric pollution research, and radiological health. Also included are references to the various pursuits in sanitary engineering—teaching, travel, research, operations, and so forth.

The film is available from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D. C.; the Film Library, Communicable Disease Center, Public Health Service, 50 7th Street NE, Atlanta 5, Ga.; or engineers in the Department of Health, Education, and Welfare regional offices.

Systematic collection of epidemiological data on suicides may help in understanding the causes of suicide. The study also concludes that the family physician is in a key position to recognize the potential suicide and refer him to psychiatric resources as a hygienic precaution.

Study of Suicide in Philadelphia

JACOB TUCKMAN, Ph.D., and MARTHA LAVELL, M.S.S.

SUICIDE is an important and pressing problem. The figure of 141 suicides reported in Philadelphia in 1955 is not substantially lower than the 176 automobile fatalities in the same period. The importance is not lessened by the fact that there has been a downward trend in suicide since 1900, when the rate of suicide in Philadelphia was 11.3 per 100,000. In 1955 it was 7.2 per 100,000. In general, the 1900-55 trend in Philadelphia parallels that for the United States during the same timespan.

In cooperation with the office of the medical examiner, the division of mental health of the Philadelphia Department of Public Health conducted a study of suicides that occurred in Philadelphia during the 5-year period 1951-55. The purposes of the study were (a) to learn more about the characteristics of individuals who commit suicide, (b) to determine what data should be gathered routinely to obtain a better understanding of the suicide, and (c) to determine ways in which a public health agency might be instrumental in the prevention of suicide.

Data on the suicides were obtained from the records in the office of the medical examiner. The records included information obtained by police who questioned immediate members of

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the family, relatives, neighbors, landlords, and occasionally the family doctor at the time of the suicide. Additional facts had been obtained from the person who identified the body at the morgue. When members of the immediate family were too upset to perform this task, a more distant relative or friend less emotionally involved was substituted. In some cases information had been obtained at a formal inquest. Since the data were gathered from many different sources, it is understandable why the records showed considerable variation in the amount of information. When the suicide was a single person without relatives the information was sketchy.

Very little knowledge of the dynamics in the suicide was obtainable from the records, but some inferences about contributory factors and motivation can be drawn. Extreme caution, however, should be exercised in the interpretation of such data because the information may be unreliable and because factors found to be associated with suicide may not be causally connected.

Classification of Suicides

In Philadelphia, during the 5-year period 1951-55, 742 deaths were classified as suicides by the office of the medical examiner. Of these, 555, or 75 percent, were men and 187, or 25 percent, were women. For whites, the sex ratio was 74 percent men and 26 percent women; for

the nonwhites, it was 83 percent men and 17 percent women. Because of the small number, the 12 nonwhite women in this study are not analyzed separately.

Ten percent of the suicides were nonwhite, whereas in the Philadelphia general population aged 15 years and older in 1950, 17 percent were nonwhite. The under-representation of nonwhites among suicides in Philadelphia follows the national pattern (1).

Of the total group, 90 percent were residents of Philadelphia, 9 percent were nonresidents, and about 1 percent were persons whose residence was not determinable.

Using the average estimated health district population during the 1951-55 period as a base, and the residential address of each suicide, rates were calculated for the 10 health districts into which the city is divided. The rates varied from 5.1 to 9.0 per 100,000 population in the various health districts. The highest rate was found for the center-city district, which includes cheap hotels, rooming houses, and "skid row." This finding agrees with those in studies in Chicago (2,3), in Minneapolis (4), in Seattle (5), and in Providence (6) that suicide is more prevalent in socially disorganized parts of the city.

The data, however, do not support the conclusion of the Minneapolis study that the suicide rate decreases in direct proportion to the number of miles from the center of the city. Actually, it is most difficult to make any generalizations about the distribution of suicides among the health districts because of (a) the lack of accurate population statistics within each health district, (b) the shifting of population from one health district to another, and (c) the number of factors associated with suicide, such as sex, race, age, and marital status. At best the data suggest that the suicide rate varies less than the incidence of mental disorder from one health district to another (7).

Philadelphia's suicide rate of 7.2 is lower than the national rate, which was 10.1 in 1953, the latest year for which statistics are available (1).

The Philadelphia rate is also lower than that of other large cities. For example, in Detroit (8) and in Baltimore (9) the suicide rates in 1955 were 9.8 and 10.0. In Cleveland (10) the

Table 1. Suicide rate¹ per 100,000 population, by age, sex, and race, Philadelphia, 1951-55

Age group	White		Nonwhite		Total group
	Males	Females	Males	Females	
75 and over	47.1	7.7	10.8	0	21.7
65-74	35.2	9.2	20.7	3.0	19.9
55-64	35.8	7.4	14.7	1.6	19.7
45-54	16.5	6.6	4.2	1.7	9.9
35-44	9.4	6.2	10.4	1.8	7.3
25-34	6.7	2.8	13.1	1.0	5.0
15-24	2.9	0.7	1.6	1.9	1.8
Total rate ²	12.1	4.0	6.6	1.2	7.2

¹ Rates calculated by dividing the total number of suicides in each age group in the 5-year period by the appropriate 1950 census figures multiplied by 5.

² Does not take into account the age-specific rate for each group.

suicide rate for 1953-54 was 12.8. For Cleveland and Baltimore, rates were 14.4 and 11.8 for whites, and 5.7 and 5.3 for nonwhites. The Philadelphia rates for the 1951-55 period were 7.9 for whites and 3.7 for nonwhites.

The lower rates in Philadelphia are difficult to explain. Presumably, the pressures of day-to-day living are no less in Philadelphia. It may be that the differences between the local rate and rates elsewhere in the country are a function of the adequacy of the reporting of suicides in Philadelphia. The medical examiner indicates a possibility that Philadelphia's suicide rate during the years in question may have been spuriously low. With the present improved laboratory facilities and more thorough investigation, the number of deaths classified as suicides may be expected to increase.

Age and Marital Status

The age of the suicides ranged from 15 to 94. There were significant (.01 level) sex and race differences. Among whites, 76 percent of the men were over 45 years of age compared with 63 percent of the women. Among males, the majority of nonwhites were under the age of 45; while the majority of whites were above the age of 45. The median age was 57.5 for white males, 51.1 for white females, and 38.0 for nonwhite males.

Age-specific rates, given in table 1, show a clear tendency for suicide rate to increase with age. There are, however, important differences between whites and nonwhites and between men and women. For whites, the increase of suicide rate with age is clear and is somewhat more pronounced for men than for women. These age differences generally agree with suicide rates for the country as a whole although the national rate for white women most frequently reaches a peak between the ages 55-64 and then decreases (1).

For nonwhite men, the suicide rate does not increase consistently with age. This may be a function of the small number of cases in the sample. It is clear, however, that the rate is highest for nonwhite males in the 65 years of age and older category.

Information on marital status, presented in table 2, was available in nearly all cases. It can be seen that nonwhites had a higher proportion of separated or divorced (23 percent) than the whites (13 percent), fewer widowed (4 percent) than the whites (17 percent), and more single persons (27 percent) than the whites (19 percent). The significant difference in marital status between whites and nonwhites may be, in part, due to differences in age. Since the nonwhites were a younger group, one would expect a lower incidence of widowed among them than among the whites. However, the differences between the two groups in the proportion of separated or divorced cannot be attributed to differences in age.

The marital status of the suicides was different from that of the general population in

Table 2. Marital status of suicides, by race and sex (in percentages), Philadelphia, 1951-55

Marital status	White		Nonwhite		Total group (N= 742)
	Males (N= 496)	Fe-males (N= 175)	Males (N= 59)	Fe-males (N= 12)	
Single-----	20	17	27	25	20
Married-----	49	47	42	67	48
Widowed-----	16	22	3	8	16
Divorced or separated-----	14	13	27	0	14
Not stated-----	2	1	0	0	2

Philadelphia (1950 census). Comparisons were made between the suicides and the general population for those between the ages of 25 and 44 and those 45 years of age and older. No comparisons were made for the group under 25 years of age because there were only 26 suicides in this age category.

Among the suicides, there was a higher incidence of single, widowed, and separated or divorced persons than in the general population. The difference between the suicides and the general population was evident for both men and women and for whites and nonwhites in the two age groups. Of the white men aged 25 to 44, 30 percent of the suicides were single compared with 20 percent of the general population; 23 percent of the suicides were separated or divorced compared with 4 percent of the general population. For white women and nonwhite men, the differences between the suicides and the general population were similar.

For the age group 45 and over, the differences between the suicides and the general population were less marked with respect to single, and separated and divorced persons, but were in the same direction. As may be expected, a larger proportion of people in this age category were widowed than in younger age groups. For white men and women, but not for nonwhite men, the incidence of widowed was greater for the suicides than for the general population.

Nativity and Employment

Data on nativity indicated that 25 percent of the entire group was foreign born: 7 percent of the nonwhites and 27 percent of the whites. This is considerably higher than the 1950 census figures for Philadelphia, which show only 11 percent foreign born. This difference is more apparent than real and is due to the higher incidence of older people among the suicides than in the general population. When corrections are made for age, the difference between the incidence of foreign born among the suicides and in the general population disappears (table 3).

Data with respect to employment, physical and mental health, medical supervision, history of alcoholism, history of previous attempts or

Table 3. Percentage of foreign born among white¹ suicides and in the general white population, by age, Philadelphia, 1951-55

Age of foreign born	Suicides	General population ²
65 and over-----	44	40
45-64-----	30	31
25-44-----	8	7
15-24 ³ -----	10	2

¹ Too few of the nonwhites were foreign born to permit a comparison of them with the general population.

² 1950 census.

³ Number of suicides in age group=21.

Table 4. Employment status¹ of suicides, by race and sex (in percentages), Philadelphia, 1951-55

Employment status	White		Nonwhite		Total group (N= 623)
	Males (N= 489)	Females (N= 69)	Males (N= 59)	Females (N= 6)	
Employed-----	35	39	31	17	35
Unemployed-----	26	25	25	0	26
Retired-----	14	4	3	0	12
Not stated-----	25	32	41	83	28

¹ Excluding housewives and students.

threats, and reported causes, are given for the total group only. Because of the high proportion of cases in which no information was available for these factors, it was not possible to make valid comparisons by race and sex.

Twenty-six percent of the suicides (table 4) were reported to have been unemployed. In half of the unemployed cases, poor physical or mental health was given as the reason for unemployment; in only 3 percent of the cases, seasonal opportunities for work or poor performances on the job were given as reasons, and in the balance of the cases the reason was not stated.

A breakdown by age groups shows very little variation in the percentage of individuals unemployed. The percentages vary from 23 percent of those in the age group 25-44 years to 28 percent of those in the age group 45-64 years. Of those in the 65 and older age category, 23 percent were reported to have been unemployed

and 39 percent retired. For those below the age of 65, the incidence of unemployment is considerably greater than that found in the general population of Philadelphia, and even this is an underestimation since no information was available on employment for about 30 percent of the cases. For those 65 and older, the percentage unemployed or retired is about the same as in the general population in this age category, but information was lacking in 23 percent of these cases.

Physical and Mental Health

Reports of physical health (table 5) had been obtained from a number of different sources, usually from immediate members of the family and other relatives, from friends and neighbors, and occasionally from the family physician. Of the entire group 43 percent were reported to have been in poor health. Good health was reported in only 8 percent of the cases. In 48 percent of the cases no information was available about health status.

Information varied regarding mental illness (table 6). In some cases, the record referred to the fact that the deceased had been suffering from a nervous or mental condition without specifying symptoms. In others a nervous or mental condition was mentioned, together with specific symptoms indicating disturbance in mood, feelings, or behavior. These were primarily described as depressed states, but also as morose, brooding, agitated, upset, worried, confused, queer, acting odd, or remote. In still others the record made no mention of nervous or mental condition but did contain a de-

Table 5. Physical health of suicides as reported by relatives and friends, by race and sex (in percentages), Philadelphia, 1951-55

Health	White		Nonwhite		Total group (N= 742)
	Males (N= 496)	Females (N= 175)	Males (N= 59)	Females (N= 12)	
Good-----	8	9	10	8	8
Ill-----	47	39	29	25	43
Not stated-----	45	53	61	67	48

Table 6. Reported mental condition of suicides, by race and sex (in percentages), Philadelphia, 1951-55

Mental condition	White		Nonwhite		Total group (N = 742)
	Males (N = 496)	Females (N = 175)	Males (N = 59)	Females (N = 12)	
Presumably normal	4	3	0	0	4
Nervous or mental condition	27	55	19	33	33
Mood or behavioral symptoms	39	29	24	17	35
Not stated	30	13	57	50	28

scription of mood, feelings, or behavior. For two-thirds of those suffering from a nervous or mental condition, but for only 3 percent of those with disturbances of mood and/or behavior, a history of nervous or mental condition was also reported.

Of the total group, 10 percent were reported to have had a history of alcoholism. This incidence may be an underestimation since information was not available for 90 percent of the cases. Nevertheless, the incidence of alcoholism among the suicides is considerably greater than that found among the general population, which has been calculated to be 4 percent by the alcoholism unit of Philadelphia General Hospital on the basis of the Jellinek formula.

Receiving Medical Care

In the case of persons who had been under medical care (table 7), the majority of the records gave the name of the physician and usually indicated whether the suicide had been under general medical supervision or under psychiatric care. When there was any doubt, the name of the physician was checked in the county medical society directory. In the other cases, the record merely stated that the deceased had been going to a doctor. In these cases it was not possible to determine the kind of medical care the deceased had received. As would be expected, there was a higher proportion under medical care (77 percent) among those for whom poor physical or mental health was reported.

Of the entire group, 13 percent were reported to have threatened suicide and an additional 9 percent had made one or more attempts. For 3 percent of the cases both previous attempts and threats were reported. Twenty-five percent incidence of either threats or attempts is probably an underestimation, since three-fourths of the records had no information on this point and in some cases threats were implied: "said he would be better off dead," "several times had said she wanted to die," "told wife he had nothing to live for and would be better off dead."

Causes of Suicide

The reported causes for the suicide, or unusual circumstances preceding the death, varied considerably. The causes, and the percent reporting these causes, are presented in table 8.

It is interesting to note that, although two-fifths of the suicides had been reported by relatives and friends to have been in poor physical health, it was given as the cause for suicide by only 18 percent. A similar discrepancy exists for mental disorders. However, it is possible that mental disorders may have been implicit in reasons classified under other categories: disturbed over the death of a relative, depressed, or very much upset when the spouse left him.

Although it is not valid to treat the data statistically because no information is available in nearly half of the cases, the findings suggest that age may be a factor in the causes or un-

Table 7. Medical care and supervision of suicides, by race and sex (in percentages), Philadelphia, 1951-55

Type of care	White		Nonwhite		Total group (N = 742)
	Males (N = 496)	Females (N = 175)	Males (N = 59)	Females (N = 12)	
Medical	29	41	8	8	30
Psychiatric	5	9	0	8	6
Type not specified	14	22	19	25	16
None	6	7	7	17	6
Not stated whether under care	46	21	66	42	41

Table 8. Reported causes or unusual circumstances in suicides, Philadelphia, 1951-55

Causes	Example	Percent of suicides ¹
Physical illness	Chronic illness	18
Mental disorders	Depression	12
Death or illness of relatives	Spouse died	8
Financial and job difficulties	Laid off from job	7
Disturbed family relationships	Wife left him	5
Police or court action	Awaiting trial	4
Violence including threats	Murdered wife	4
Changed environment	Immigrated to city	2
Unhappy love affair	Jilted by girl friend	1
Miscellaneous	Suicide pact	1
None stated		44

¹ In about 5 percent of the suicides, more than one reason was given.

usual circumstances preceding the suicide. For those 45 years and older physical illness was reported as the cause in 25 percent of the cases compared with 3 percent for those under 45; while mental illness was mentioned as the cause in 9 percent of those 45 and older compared with 19 percent of those under 45. Disturbed family relationships were given as the cause for 13 percent of those under 45 compared with 2 percent of those 45 and older. Violence also seemed to be operating more in the younger group (10 percent compared with 2 percent of those 45 and older).

Method of Suicide

The method of suicide most frequently used was hanging, usually by rope (table 9). Firearms was second, and poison was third. Poisons included household drugs and chemicals such as barbiturates, aspirin, and morphine, and lye, ammonia, phenol, turpentine, and arsenic.

There was a significant sex difference with respect to the methods employed. Women were more likely to use poison and gas and less likely to use firearms than men. No significant race differences were found in method of suicide but age was a factor for men. Forty-two percent

of the men aged 45 and older used hanging compared with 32 percent of those under 45; while 22 percent of those under 45 used poison and gas compared with 13 percent over 45.

Place of Suicide

The majority of the suicides took place in the home of the deceased (table 10). Twenty percent occurred on the street and in other public places. Women were more likely to commit suicide in their own homes and less likely to do so on the street and other public places. Of those suicides that occurred in the home, the bedroom and cellar were the preferred places. Each of these was chosen in about one-third of the cases. The kitchen and bathroom were each used by about 10 percent of the cases.

Twenty-four percent of the entire group left one or more suicide notes. A comparison of those who left notes with those who did not shows no significant differences with respect to sex, age, race, or marital status.

There was a significant difference, however, in regard to the method of suicide. Poison was used by 18 percent of those who left notes, but by 8 percent of those who did not leave notes. Firearms were used by 29 percent of those who left notes, but by 19 percent of those who did not. By contrast, hanging was the method used by 40 percent of those who did not leave notes, but by 31 percent of those who did.

No relationship was found between suicide

Table 9. Method of suicide, by race and sex (in percentages), Philadelphia, 1951-55

Method	White		Nonwhite		Total group (N = 742)
	Males (N = 496)	Females (N = 175)	Males (N = 59)	Females (N = 12)	
Hanging	41	34	27	33	38
Firearms	26	8	22	25	21
Jumping	8	14	14	17	10
Cutting or piercing	6	2	5	8	5
Poison	7	22	9	17	11
Gas, carbon monoxide	9	14	10	0	10
Drowning	2	2	14	0	3
Other	2	3	0	0	2

Table 10. Place of suicide, by race and sex (in percentages), Philadelphia, 1951-55

Place	White		Nonwhite		Total group (N = 742)
	Males (N = 496)	Females (N = 175)	Males (N = 59)	Females (N = 12)	
Home	66	80	51	83	68
Business	5	1	2	0	4
Hospital	5	5	2	0	4
Relative's house	2	2	3	0	2
Prison	2	0	7	0	2
Other	21	12	36	17	20
Not stated	0	1	0	0	(¹)

¹ Less than 0.5 percent.

and day of the week, month of the year, day of the lunar month, or season of the year. Certain times of the day are preferred to others, but the findings should be interpreted with considerable caution since information was available for only 38 percent of the cases. Of these, one-fifth occurred between 9 a. m. and 12 noon, one-sixth between noon and 3 p. m., and another one-sixth between 6 a. m. and 9 a. m. Only one-tenth occurred between midnight and 6 in the morning.

Discussion

This study, like other epidemiological studies of suicide, is limited because of the inadequacies of medicolegal records. Coroners, of necessity, gather information to establish the cause of death rather than to understand the suicide. If more significant insights and knowledge about suicide are to be developed, systematic information needs to be gathered at the time of death. Such information about the suicide should include his developmental background, extent of education, stability of employment, income, health, history of previous psychiatric hospitalization including diagnosis of mental disorder, interpersonal relationships, pattern of adjustment, temperament, interests, stress situations, and whatever other factors that may be deemed important. Such information should

be obtained not only from members of the family, relatives, and friends but also from more objective collateral sources, such as the family doctor and employer, and through search of court, hospital, and social agency records.

The important finding of this study was that the majority of the suicides had been under medical supervision prior to their death, usually by the family doctor. This suggests that the family doctor is in a key position to recognize psychiatric problems in his patients at the earliest possible time and to refer them to appropriate psychiatric resources for special care and treatment. It would be helpful if material on the problem of suicide, with emphasis on methods of detecting individuals with suicidal tendencies, were introduced in the medical school curriculum.

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Durations of Illness Among Personnel of the Air Force

HENRIK M. C. LUYKX, D.Sc., and BETTY L. MURRAY, B.A.

MILITARY medical records maintained for the care of the patient are a unique source of data relative to durations of illness. In the Armed Forces, excusal from duty because of illness and subsequent return to duty require the approval of a physician and the preparation of a medical record. Each record shows the diagnosis made by the physician and the total time lost from duty, whether the person was treated in a hospital or in an infirmary, and whether he was in quarters or on sick leave. These data, therefore, are more extensive than those in which only the hospital phase of an illness is recorded, and at the same time they are more reliable than those in which an individual reports his own illness.

A medical record is prepared for each admission, which constitutes enrolling as a patient, a military person whose treatment requires that he be excused from duty beyond midnight of the day on which he reported for treatment. The day of admission is a day of illness; the day of discharge is a day of duty. By definition, therefore, a minimum of 1 day is counted for each admission. Convalescent leave is included in time lost for those patients who must return from such leave for further care and treatment. Convalescent leave granted patients who will return to duty upon expiration of such leave is not included.

The duration of illness, for purposes of this

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discussion, refers to total time in an excused-from-duty status during one continuous episode of illness. Included in this study are only those cases returned to duty in 1954, regardless of when admitted. Excluded are fatal cases and those terminated by separation from the service for physical disability. (Return to duty is effected for 98 percent of the patients admitted.)

Table 1 shows selected measures related to the distribution of days lost by 24,508 cases of illness. The mean duration per illness was 12 days. This measure is, of course, influenced by the prolonged duration of relatively few cases. The fact that 75 percent of the cases returned to duty within 10 days (conversely, 25 percent remained 10 days or longer) shows that most Air Force illnesses are of a very short duration. This is to be expected since illnesses of a chronic or prolonged nature are likely to result in disability separation, infrequent in the Air Force population, and not included in this study.

Illnesses of a minor nature may be recorded as excused-from-duty cases for some military persons because domiciliary care (provision of meals in barracks) is normally not available. Also, the same individual may be included more than once either for separate initial occurrences of a given condition or for a recurrent attack of the same condition. A balancing factor, however, is that short-term illnesses treated on an outpatient basis are not included in this study.

Time lost because of a given condition can be discussed adequately only when that condi-

tion is reported as the sole cause of admission. A single diagnosis is rendered for most illnesses (90 percent) reported among Air Force personnel. Durations of illnesses for multiple diagnosis cases are difficult to interpret because of the different accompanying diagnosis which may or may not prolong the time assigned to the primary cause of illness. Consequently, consideration is focused here on those cases in

which only one diagnosis was reported and which occurred in large enough numbers for meaningful analysis.

Table 2 and figures 1 through 14 pertain to single diagnosis illnesses which resulted in return to duty in 1954. In comparing the shapes of these distributions, it should be observed that two different scales have been used along the abscissa—a 1-day interval or a 10-day interval,

Table 1. Duration of illness among patients returned to duty, U. S. Air Force, 1954

Cases	Number of illnesses ¹	Mean days lost	Range of reliability of mean days lost ²	Day after admission on which percentage of cases remained		
				50 percent ³	25 percent	10 percent
Total-----	24, 508	12. 0	11. 7-12. 3	5th	10th	25th
Single diagnosis-----	22, 018	10. 2	9. 9-10. 4	5th	9th	21st
Multiple diagnosis-----	2, 490	28. 2	26. 0-30. 5	11th	28th	65th

¹ In a random 10 percent sample of Air Force personnel.

² ± 2 standard errors.

³ Median day.

Table 2. Duration of illness for specified diagnostic conditions, patients returned to duty, U. S. Air Force, 1954¹

Diagnosis	Number of cases in 10 percent sample	Mean number of days lost	Range of reliability of mean days lost ²	Day after admission on which the specified percentage of cases remained		
				50 percent ³	25 percent	10 percent
Common cold (47000)-----	1, 553	3. 5	3. 4-3. 7	3d	5th	6th
Streptococcal sore throat (051)-----	543	5. 3	5. 1-5. 5	5th	6th	7th
Anxiety reaction (310)-----	149	11. 5	8. 1-14. 9	5th	9th	25th
Tonsillitis, chronic, with tonsillectomy or adenoidectomy (51013)-----	224	7. 6	7. 1-8. 2	7th	9th	12th
Fracture of radius or ulna or both (813)-----	47	21. 7	7. 6-35. 8	8th	21st	53d
Appendicitis, acute, uncomplicated (55000)-----	323	11. 6	10. 9-12. 3	9th	14th	20th
Mumps (089)-----	142	11. 2	10. 4-12. 1	10th	14th	17th
Pneumonia, primary atypical (49200)-----	235	13. 4	12. 0-14. 9	10th	17th	24th
Hernia, inguinal, indirect (56001)-----	199	14. 9	13. 7-16. 2	13th	19th	26th
Arthritis, all forms (720-725)-----	103	28. 5	20. 9-36. 0	13th	35th	84th
Fracture of tibia or fibula or both (823)-----	78	43. 3	29. 1-57. 6	13th	59th	152d
Pilonidal cyst (221)-----	320	18. 9	16. 8-21. 0	14th	24th	36th
Ulcer of duodenum (not perforated) (54100)-----	210	26. 2	22. 7-29. 7	20th	30th	55th
Infectious hepatitis (092)-----	160	52. 0	47. 2-56. 9	49th	68th	87th

¹ Data are based on a random 10 percent sample of Air Force military personnel.

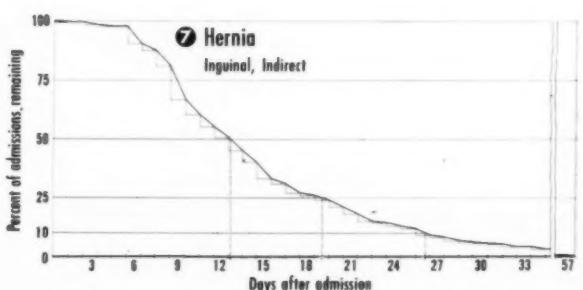
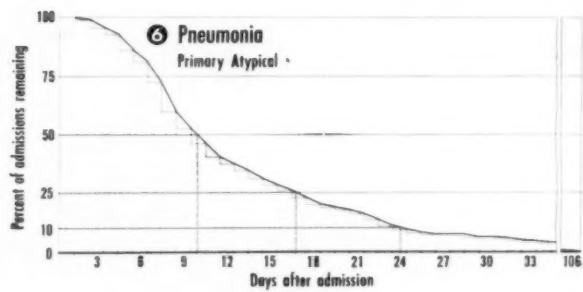
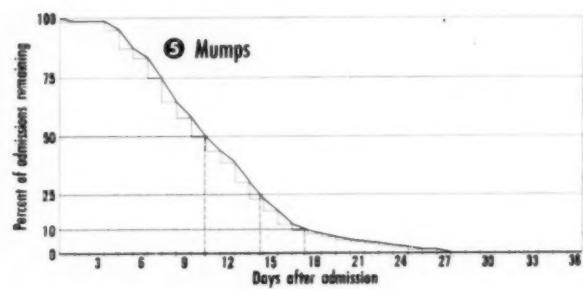
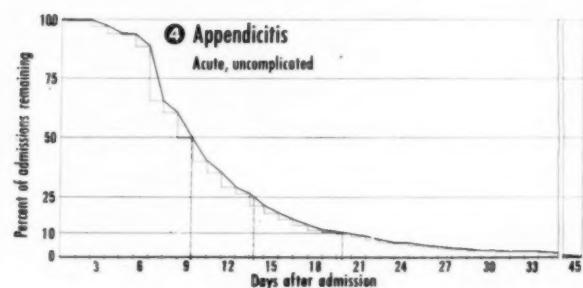
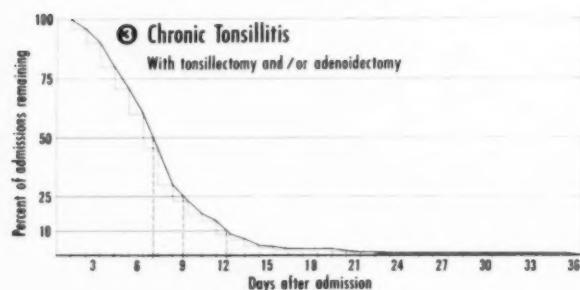
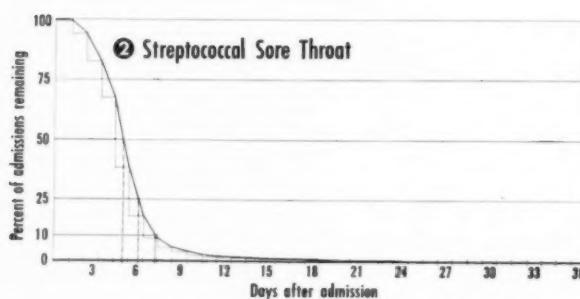
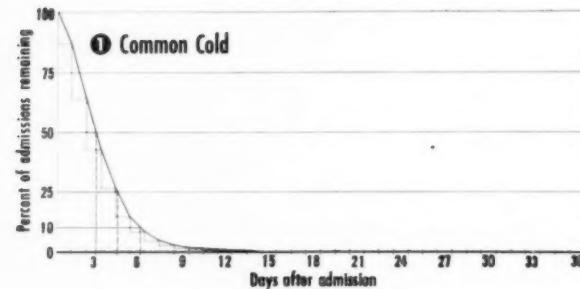
² There is about 1 chance in 20 that the true average lies outside this range (± 2 standard errors).

³ Median day.

SOURCE: DD Form 481; DA Form 8-24; NAVMED-F Card.

NOTE: Numbers in parentheses after diagnoses are from the International Lists (sixth revision) with U. S. Air Force expansion.

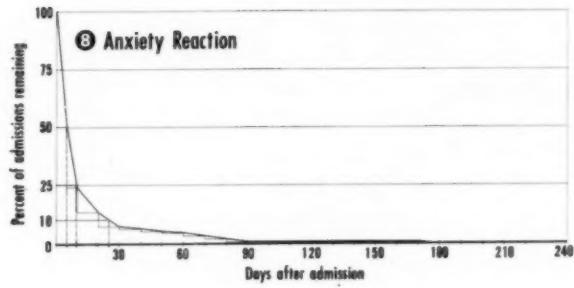
Durations of illness among Air Force personnel in 1954 showing, of those who subsequently returned to duty, the percent of patients remaining on specified day after admission.



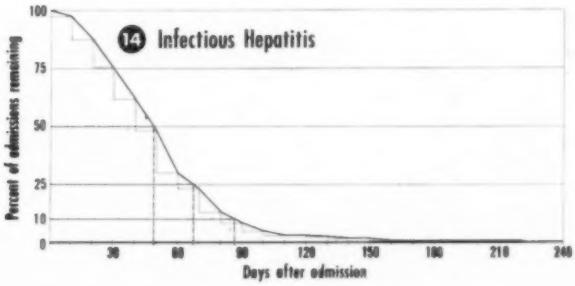
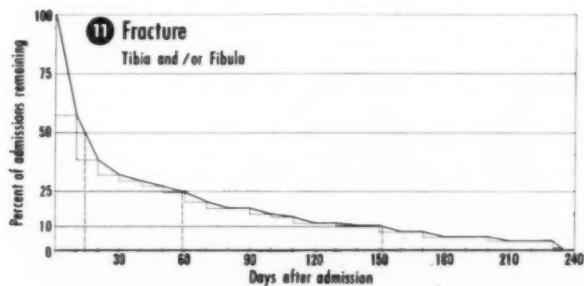
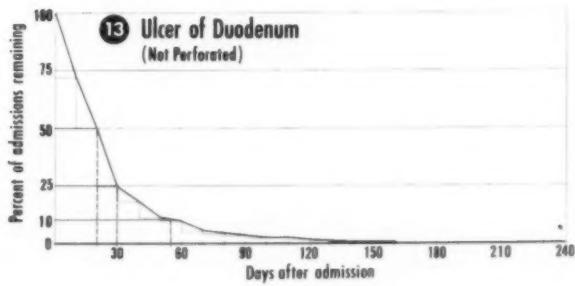
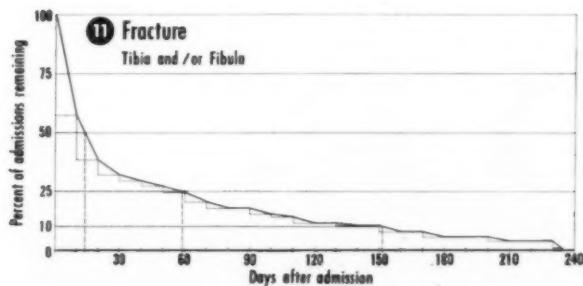
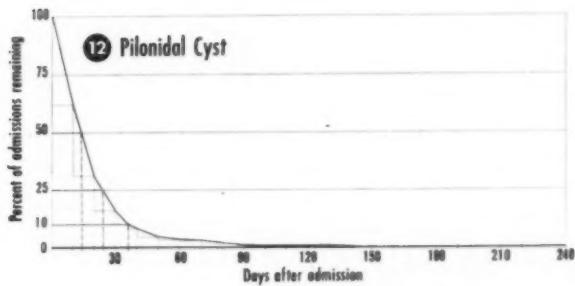
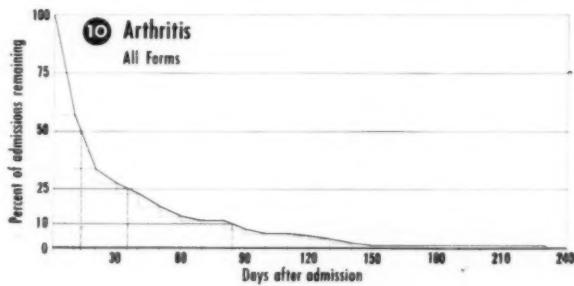
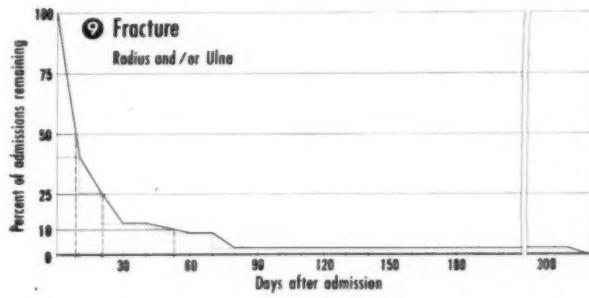
for convenience in presentation. The selected diagnostic conditions have been arrayed in table 2 in order of magnitude of median duration; the graphs, however, have been grouped according to the scale of the abscissa, for easier comparison.

The mean duration, even though influenced by extreme values, has its use as a descriptive parameter. For example, to compute total days lost or accumulated patient loads, for a given diagnosis or for a group of conditions, their mean durations must be known. On the other

hand, percentiles often provide more meaningful measures of a distribution of durations. The most commonly used percentile in vital statistics is the median (50 percent mark). This measure indicates the "middle" duration value. Furthermore, position of this measure in relation to the mean indicates the direction of skewness in an asymmetrical frequency distribution. Frequency distributions according to days lost are not plotted here. The graphs shown are inverse cumulative distributions, thus constituting "cases remaining" curves.



Durations of illness among Air Force personnel in 1954 showing, of those who subsequently returned to duty, the percent of patients remaining on specified day after admission.



Most of the distributions of the illnesses in this study are highly skewed to the right (or even J-shaped). In all instances the mean duration is greater than the median duration. Although any point or points on the percentile scale may be selected for the purpose at hand, the 25 percent and 10 percent marks have been chosen as additional informative measures because of common usage. They represent the number of days of illness elapsed before 75 percent and 90 percent of the cases, respectively, were returned to duty.

Table 2 and the 14 charts show, for each diagnosis, the number of illnesses observed, the mean duration, and the proportion of admissions remaining, by days after admission, with notation of the three percentile points mentioned. Any point on a particular curve indicates the elapsed days of illness (bottom scale) before a given proportion of the cases was returned to duty (complement of the scale at the left). Also, the range of days lost may generally be read directly from the horizontal scale, and, in addition, the modal day of discharge

(the duration most frequently encountered) is at the point showing the steepest drop of the curve.

Noting, for specific illnesses, the difference between the mean and the median gives a measure of the skewness of the distribution. Since skewness is almost invariably to the right, the greatest asymmetry occurs for those illnesses having some unusually prolonged cases. The reason for such skewness is the same as that for a greater range in the distribution, namely that certain diagnostic entities include a large variety of cases with heterogeneous characteristics, as opposed to other diagnoses which include a more homogeneous group of cases. The latter show a smaller range of durations and at the same time greater symmetry in the distribution.

For example, cases of acute uncomplicated appendicitis (fig. 4) of longer than 20 days'

duration were largely accounted for by persons discharged from the hospital who were required to return there at the end of convalescent leave. The type of operation or surgical procedure (not tabulated from these records) in treatment of pilonidal cysts (fig. 12) and duodenal ulcers (fig. 13) has a direct bearing on the duration of illness. The nature of a fracture (figs. 9 and 11) strongly affects the duration; in one case, a compound, comminuted fracture of the radius and ulna with nerve involvement lost 318 days. Other diseases such as the common cold (fig. 1) and streptococcal sore throat (fig. 2), showing a smaller spread of the distribution of durations and concurrent symmetry, suggest a greater homogeneity of characteristics. The means and medians here have approximately the same value.

CDC Laboratory Refresher Training Courses

Refresher training in laboratory methods of diagnoses will be offered at the Communicable Disease Center, Chamblee, Ga., during the period September 1958 through April 1959. Two courses in the following schedule will be presented in two parts, and three will be repeated.

Parasitic diseases:

Part 1. Intestinal parasites. Sept. 15-Oct. 10.
Part 2. Blood parasites. Oct. 13-31.

Rabies. Oct. 6-10; Jan. 12-16.

Viral and rickettsial diseases. Oct. 13-24; Mar. 9-20.

Tuberculosis. Oct. 20-31; Jan. 26-Feb. 6.

Medical mycology: Cutaneous, subcutaneous, and systemic fungi. Jan. 5-30.

Study of pulmonary mycoses. Feb. 9-20.

Veterinary mycology. Mar. 2-6.

Bacterial diseases:

Part 1. General bacteriology. Mar. 2-13.
Part 2. General bacteriology. Mar. 16-27.

Serologic methods in microbiology. Mar. 16-Apr. 3.

Bacterial diseases: Enteric bacteriology. Mar. 30-Apr. 10.

Courses in the following will be offered by special appointment only:

Laboratory methods in the diagnosis of malaria.

Special training in virus techniques.

Typing of *Corynebacterium diphtheriae*.

Special problems in enteric bacteriology.

Phage typing of *Salmonella typhosa*.

Laboratory methods in the diagnosis of leptospirosis.

Serologic differentiation of streptococci.

Bacteriophage typing of staphylococci.

Information and application forms should be requested from the Laboratory Branch, Communicable Disease Center, Public Health Service, P. O. Box 185, Chamblee, Ga.

Commissioned Officer

STUDENT TRAINING AND EXTERN PROGRAM

WILLIAM L. ROSS, M.D.

DURING the 1957 summer months, 120 students from 67 approved professional schools of medicine, dentistry, engineering, and science spent their vacations as Public Health Service Reserve Officers on active duty under the Commissioned Officer Student Training and Extern Program, a career development program known as COSTEP.

COSTEP offers second-year and third-year medical, dental, and engineering students, and science students at the graduate level, on-the-job training in Public Health Service assignments commensurate with their education. These young men and women are thus able to further their professional knowledge and gain experience while earning a salary during breaks in the academic year.

A program must have a purpose, and COSTEP has four:

1. To interest promising students in careers in the Public Health Service.
2. To assist students in furthering their professional knowledge while earning a salary.
3. To give students an opportunity to learn about the functions of governmental health agencies at the National, State, and local levels.
4. To provide the Service with competent personnel during vacation periods.

Last summer's group of 120 students was the largest in the training program's brief history and the first group to participate in the program since it went on a 12-month schedule. The Service has been employing students during the summer months since 1948, when 49 medical students were appointed Reserve Officers in the

Service's Commissioned Corps and called to active duty during school vacations. The commissions were terminated, however, when the students returned to school in the fall. This procedure was repeated in 1949 and 1950.

During the 1951-54 period, dental, engineering, and graduate science students, in addition to medical students, were employed during the summer months under the civil service system. In 1955, students accepted for the Summer Student Program—as it was then known—were appointed to the Commissioned Reserve (the inactive duty reserve component of the Commissioned Corps) and called to active duty when the spring semester ended.

Last year, the program was officially designated as COSTEP, and on July 1, 1957, went on a 12-month basis. This permits students attending schools on the quarter system, with vacations at times other than the summer months, to receive Service assignments during their free periods. As an added inducement, students still in school who have satisfactorily completed a COSTEP assignment are eligible to apply for reassignment the following year.

Assignments

Research assignments under COSTEP are available at the National Institutes of Health in Bethesda, Md., the Communicable Disease Center in Atlanta, Ga., the Sanitary Engineering Center in Cincinnati, Ohio, or in Public Health

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Service field activities elsewhere in the country.

Clinical assignments are available in several of the Service's 16 general and specialty hospitals and many of its 55 hospitals maintained for American Indians and Alaska natives.

Students interested in preventive medicine may be assigned to a wide variety of public health programs in many parts of the country. They participate in communicable disease control, sanitary engineering activities, general epidemiology, accident prevention, air pollution control, chronic disease control, occupational health programs, tuberculosis control, venereal disease control, and other related activities.

Second-year students, as a rule, are assigned to research activities. Third-year medical and dental students are usually given preference for clinical clerkships or preventive medicine assignments, but are not excluded from research work. Assignments to clinical clerkships in Alaska are given only to students who are able to serve at least 90 days on active duty.

By category, assignments are generally as follows:

Medical students are assigned to the Service's general and specialty hospitals (up to 1,250-bed capacity) and to its Indian hospitals in the United States and Alaska. They may engage in employee health programs or become research assistants in preventive medicine activities. Some are assigned to mental health studies, and others become research assistants in pharmacology, biochemistry, psychology, metabolic studies, neuropsychology, neurochemistry, and related fields of medical-biological research.

Dental students perform essential duties as research assistants in genetics, biochemistry, and bacteriology. They serve in the dental clinics of the Service's general and specialty hospitals and Indian hospitals. They assist regional dental consultants, work on fluoride analysis, and do field X-ray work.

Engineering students are employed in water pollution control programs, radiological health research, and field engineering for water and sewerage facilities on Indian reservations. Engineering students also work on field survey teams and assist in planning and engineering construction, and in air-conditioning design, construction, and maintenance. Assignments

are also made in insectborne and rodentborne disease control activities.

Science students are offered a variety of assignments. These include cell production and tissue culture, chemistry laboratory work, medical entomology, rabies or psittacosis studies, biological control of mosquitoes, animal psychology, sociology and anthropology, psychiatric aide assistants, social psychology aides, and mental health surveys.

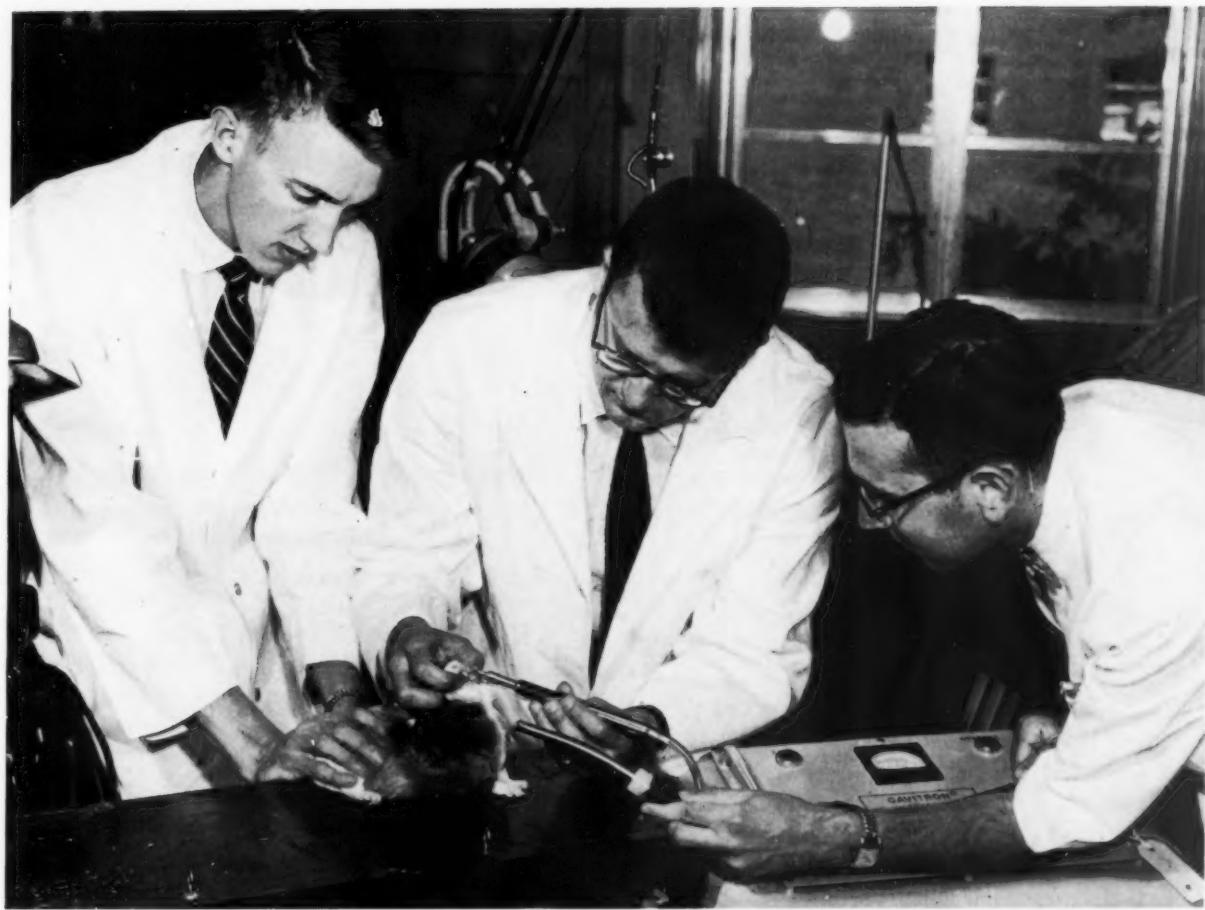
Last summer, one medical student served as assistant to the anesthesiologists in the Clinical Center, National Institutes of Health. Five medical and four dental students took medical histories, performed physical examinations, and conducted hematological studies among 5,000 inhabitants of an in-married population group in an intensive genetic field study of the prevalence of hereditary disease. A science student interested in immunology received instruction in the testing of diagnostic reagents and blood-banking procedures. A psychology student participated in studies of the treatment of children with primary behavioral disturbances.

One of the engineering students reviewed construction plans of oceangoing vessels to determine if they conformed to Public Health Service sanitation standards for water supply and distribution, food preparation, storage, and serving areas, and ratproofing. Other engineering students assisted Service engineers in survey work for water and sewerage improvements on an Indian reservation in the southwest.

Requirements and Remuneration

To be eligible for the Commissioned Officer Student Training and Extern Program, a student must:

1. Be a United States citizen.
2. Be physically qualified for appointment as a Public Health Service Reserve Officer.
3. Have completed at least 2 years of approved professional schooling by the end of the current academic year or, in the case of science students, be at the graduate school level.
4. Submit official transcripts covering undergraduate study.
5. Be recommended by a dean or department head.



Dental student (left) watches trial of a new drill on a hamster at the National Institute of Dental Research.

Students who are commissioned in the Public Health Service and called to active duty under COSTEP receive the pay and allowances of a junior assistant sanitarian, the Service officer grade equivalent to Army 2d lieutenant and Navy ensign. In addition, they are reimbursed for travel from the points at which they receive their calls to active duty to their assignments, and back to the points of origin. The monthly pay and allowances for a junior assistant sanitarian with less than 2 years cumulative service are:

	<i>With dependents</i>	<i>Without dependents</i>
Base pay-----	\$222.30	\$222.30
Quarters-----	85.50	68.40
Subsistence-----	47.88	47.88
Total-----	\$355.68	\$338.58

The Federal income tax, computed on base pay only, is withheld from each month's pay. Previous active and inactive duty with the Armed Forces, the Public Health Service, or the Coast Guard is counted toward longevity for pay purposes.

Students selected for COSTEP are appointed to the Commissioned Reserve and called to active duty for 60 to 90 days. Although leave is accumulated during the tour of duty, COSTEP students are not granted leave except for emergencies. At the end of the duty period, however, they are paid a lump sum for all accumulated leave.

After COSTEP

Students who perform satisfactorily may remain in the Commissioned Reserve pending

completion of professional education. Medical students retain their inactive duty status until they either apply for and are selected for Public Health Service internships or until they complete their intern training outside the Service. Those interning outside the Service, who have military obligations, are called to active duty at the completion of their internships or their commissions are terminated.

Dental students, at the completion of their professional education, may apply for either a Service dental internship or active duty as a staff dental officer.

Draft-eligible students who have satisfactorily completed COSTEP assignments may retain their reserve commissions until they receive their appropriate medical, dental, engineering, or science degrees. Once the degree is earned, the student's commission is terminated unless he applies for and receives an active duty assignment in the Public Health Service in order to fulfill Selective Service obligations. Engineer and science students who have satisfactorily completed a COSTEP assignment, and are still in school, are eligible to apply again for employment under the program.

Because the Commissioned Corps is one of the uniformed services of our country, the serving of specified amounts of time (up to 2 years) in the Corps satisfies military obligations under the Universal Military Training and Service Act. Service under COSTEP or as a Public Health Service intern, however, is not counted toward the satisfaction of military obligations.

Applications and Reserve Commissions

Students interested in COSTEP assignments during the summer months must submit their applications each year before February 1 to the Surgeon General, U. S. Public Health Service (P), Washington 25, D. C. Applications for assignment at other times of the year must be submitted at least 120 days beforehand.

It is not necessary for medical students to apply for COSTEP assignments in order to receive appointment to the Commissioned Reserve. Medical students interested in intern-

ships, active duty to fulfill Selective Service obligations, or careers in the Public Health Service may apply for appointment to the Commissioned Reserve any time after completing their first year of medical school. Dental, engineering, and science students, however, can receive reserve appointments only through COSTEP. Medical or dental students who have satisfactorily completed a Public Health Service internship are continued on active duty unless they request termination of their commissions. The Service imposes no mandatory period of duty upon its Commissioned Reserve officers.

COSTEP Survey

A survey of students who were employed under COSTEP during the summer months of 1957 disclosed that they found their assignments interesting and professionally valuable. Eighty-six percent indicated that they planned to apply for active duty in the Commissioned Corps after graduation. More than half of the group of 120—nearly all of whom are eligible for participation in 1958—are planning to apply again for COSTEP assignments. Most of the group felt that their assignments provided professional experience that would be helpful in school. Fifty-nine percent reported that they found their work "very interesting" and 71 percent found their professional education useful in their COSTEP assignments.

Features that many students named as advantages of the program were professional experience; working with congenial people; opportunity to learn new developments and exercise initiative; the ability, helpfulness, and interest of supervisors; and the opportunity to work with patients.

When asked what special efforts were made to aid in their professional development, the students mentioned the opportunity to attend hospital rounds outside their departments, outside reading and reporting to a group, attending clinical and pathology conferences, seminars, time for literature research, and the availability of experienced professional personnel to answer questions and discuss work.

Coxsackie virus group B, type 5, widely distributed in the midwest during the summer of 1956, was highly prevalent in Iowa, with lower frequencies observed in Kansas, Missouri, and Nebraska. Concurrently in Iowa, the incidence of poliovirus infection was found to be extremely low.

Infections With Coxsackie Virus B5 in Six Midwestern States

TOM D. Y. CHIN, M.D., JOHN C. GREENE, D.M.D., and HERBERT A. WENNER, M.D.

THE RECOGNIZED viral agents responsible for the syndrome defined as benign aseptic meningitis include mumps, ECHO (enteric cytopathogenic human orphan), Coxsackie, poliomyelitis, and the arthropod-borne encephalitis viruses. Observations made during the summer and autumn months of 1956 indicated an unusually high incidence of cases of aseptic meningitis in certain midwestern communities. Fecal specimens submitted for poliomyelitis surveillance studies yielded a large number of isolates identified as Coxsackie virus, type B5.

The evidence that the B5 virus was etiologically related to many of the cases observed was reinforced by a singular study of a localized outbreak of aseptic meningitis caused by Coxsackie B5 virus in Cerro Gordo County, Iowa, during the same summer (1). The present report summarizes our experiences encountered with this virus with particular reference to differences in the distribution in the six midwestern States.

Materials and Methods

During the summer and autumn months of 1956, fecal specimens obtained from 694 individuals were studied in connection with the poliomyelitis surveillance program. Of this

number, 365 were obtained from patients believed to have poliomyelitis; the remaining 329 specimens were collected from patients and family contacts during an investigation of an outbreak of aseptic meningitis. These specimens were from residents in the midwestern States of Arkansas, Iowa, Kansas, Missouri, Nebraska, and Oklahoma. In addition to the 694 fecal samples studied in the virus laboratory at the University of Kansas, the distribution study included 664 individual specimens also obtained from poliomyelitis patients, bringing the total of fecal samples to 1,358. The 664 specimens were studied in the State health department laboratories in Kansas and Missouri and in the virus laboratory of the University of Nebraska College of Medicine, results of isolations in these laboratories having been supplied by Dr. Charles A. Hunter, Irma C. Adams, and Helen W. Reihart.

Dr. Chin is assistant chief of the Kansas City Field Station, Communicable Disease Center, Public Health Service, where Dr. Greene serves as dental surgeon on temporary duty. Dr. Wenner is research professor of pediatrics at the University of Kansas Medical Center, Kansas City, Kans. Assisting in the study were Clifton R. Gravelle of the Kansas City Field Station and Vernon E. Scholes of the University of Kansas Medical Center.

Stool specimens were collected by practicing physicians or by the staff members in local hospitals. Usually single specimens were obtained. Fecal specimens were collected from household contacts only in connection with special investigation of localized outbreaks. The specimens were mailed unfrozen to the laboratory, where they were stored at -20° C. and held at this temperature until used.

The methods used for preparation of stools and for virus isolation and identification were those described by Wenner and Miller (2). Roller tube cultures of trypsin-dispersed monkey kidney cells prepared according to the methods described by Youngner (3) were routinely employed. Each specimen was tested in three culture tubes, using 0.1 ml. of stool extract per tube. The cultures were maintained for a 7-day period. Fluids of those cultures showing cytopathic changes were harvested for identification, using initially type-specific hyperimmune poliomyelitis antiserums (4). When the harvested fluid was not neutralized by each of the typing serums or by a combination of the serums, further identification was carried out with Coxsackie antiserums types 99, B1, B2, B3, B4, and B5, and with 14 types of ECHO antiserums. Neutralization was considered to have occurred if the culture tubes containing the virus-serum mixtures showed no cytopathic changes while cytolysis was present in the virus control tubes, and if this effect persisted for at least 2 additional days.

Virus Distribution in the Six States

Data on the frequency with which polioviruses and Coxsackie viruses were encountered in the specimens from 1,358 individuals submitted for study are summarized in table 1. The geographic distribution of individuals providing Coxsackie B5 viruses appears in figure 1.

The B5 virus was recovered from the stools of 270 individuals, and polioviruses, predominantly type 1, were recovered from the stools of 275. A stool from one individual yielded both poliovirus and Coxsackie B5 virus. Patients from Iowa provided a larger number of B5 viruses than those from the other five States studied. The recovery rates among 329 fecal

Table 1. Coxsackie virus B5 and poliovirus isolations from fecal specimens, by State, 1956

State	Number of persons	Coxsackie virus B5		Polioviruses	
		Number	Percent	Number	Percent
Arkansas	104	0	0.0	37	35.6
Iowa	329	173	52.6	8	2.4
Kansas	321	25	7.8	56	17.4
Missouri	424	51	12.0	141	33.2
Nebraska	165	20	12.1	29	17.6
Oklahoma	15	1	6.7	4	26.7
Total	1,358	270	19.9	275	20.2

samples from Iowa were about 53 percent for Coxsackie virus and 2.4 percent for polioviruses. In Kansas, Missouri, and Nebraska, the recovery rate for Coxsackie virus was approximately 11 percent and for polioviruses approximately 25 percent. In contrast with the experience in Iowa, Coxsackie B5 virus was not detected in fecal specimens from 104 individuals in Arkansas, although polioviruses were recovered from approximately one-third. The number of specimens originating in Oklahoma was too small for reliable comparison; nevertheless, one strain of Coxsackie B5 virus was recovered in the 15 fecal samples examined.

During the summer of 1956 aseptic menin-

Figure 1. Distribution of Coxsackie virus B5 in six midwestern States, 1956.

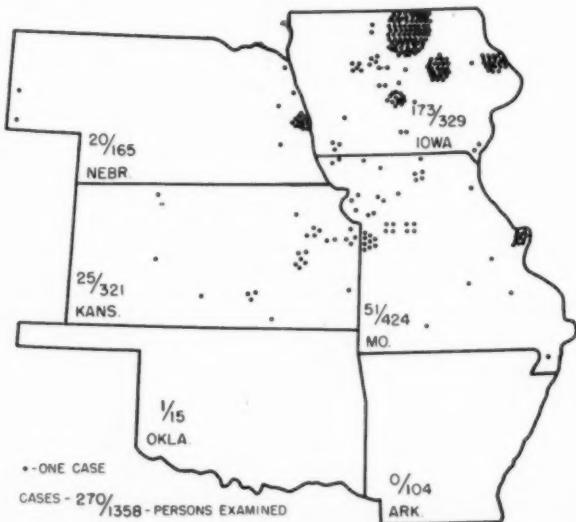


Table 2. Coxsackie virus B5 isolations from fecal specimens, by county, Iowa, 1956

County	Number of persons	Number positive	Percent positive
Cerro Gordo	135	82	60.7
Black Hawk	42	29	69.0
Dubuque	39	21	53.8
Polk	24	13	54.2
Webster	13	5	38.5
Calhoun	19	5	26.3
Others	57	18	31.6
Total	329	173	52.6

¹ Comprising 249 patients and 80 well persons.

gitis appeared in epidemic proportions in several localities in Iowa. The occurrence of this illness was first noted in Polk County during early July. In the middle of July similar illnesses were observed in Mason City, the county seat of Cerro Gordo County. Because the clinical features suggested that these illnesses were not caused by polioviruses, a detailed study was made in Cerro Gordo County in order to define the etiology and the clinical and epidemiological characteristics. Etiological studies indicated that these illnesses were caused primarily by Coxsackie virus, type B5.

The frequency with which Coxsackie B5 virus was encountered in different localities in Iowa appears in table 2. In Cerro Gordo County the virus was recovered from 82 of the 135 individuals examined. Of the 82 Coxsackie B5 strains recovered, 61 were isolated from 83 individuals with illness, while 21 were recovered from 52 well individuals, the majority being household contacts. A high frequency of virus recovery was obtained in the counties of Black Hawk, Polk, and Dubuque, whereas lower frequencies were observed in Webster and Calhoun Counties. Although extensive epidemiological investigation was conducted only in Cerro Gordo County, these data seem to indicate that a similar type of illness was also occurring in epidemic proportions in Black Hawk, Polk, and Dubuque counties.

The distribution of Coxsackie B5 viruses isolated from 144 Iowa patients by week of onset of illness appears in figure 2. The major number of isolations were made from patients who

were ill during the months of August and September with the highest frequency occurring during the middle of August. A similar distribution was obtained for patients in Cerro Gordo County alone. In the State as a whole the seasonal distribution of Coxsackie B5 virus corresponded to that observed for poliomyelitis.

The distribution of Coxsackie virus B5 isolated from stool specimens of 329 Iowa residents analyzed according to age and health status is shown in table 3. Approximately 58 percent of the individuals who had an illness manifested as either aseptic meningitis or minor illness yielded the B5 virus, while about 36 percent of those with a history of no illness excreted B5 virus. In both ill and well groups the frequency of excretion was higher among those under 20 years than in those over 20 years of age.

Discussion

The first Coxsackie viruses were recovered by Dalldorf and Sickles in 1947 (5). During the past 10 years these viruses, now constituting a family of 24 members, have been encountered with an increasing frequency in association with a variety of illnesses. As a result of recent wide application of tissue culture techniques, Coxsackie viruses of types A9, B1, B2, B3, and B4 have been commonly recovered from patients with aseptic meningitis, pleurodynia, and myalgia, and occasionally

Figure 2. Coxsackie virus B5 isolations from feces of patients, by week of onset, 1956.

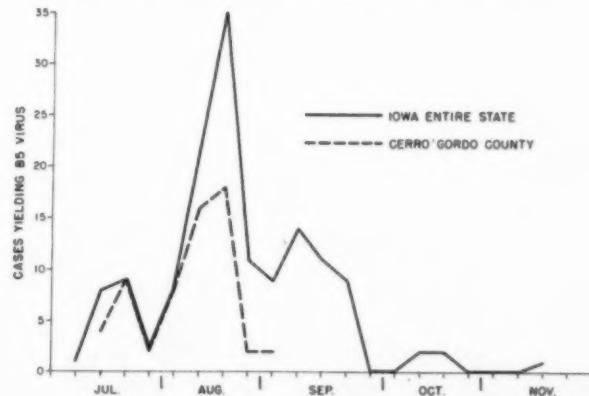


Table 3. Coxsackie virus B5 isolations from feces by age group and health status, Iowa, 1956

Age group (years)	Ill			Not ill ¹		
	Number of persons	Number positive	Percent positive	Number of persons	Number positive	Percent positive
0-4	51	35	68.6	9	6	66.7
5-9	68	40	58.8	15	6	40.0
10-14	42	27	64.3	8	5	62.5
15-19	17	10	58.8	3	2	66.7
20 and over	71	32	45.1	45	10	22.2
Total	249	144	57.8	80	29	36.2

¹ Comprising mostly household contacts.

from those with myocarditis. Until the summer of 1956, the type B5 Coxsackie virus, which was first isolated by Steigman in 1952 (6), had been found only occasionally. The data reported here and those recently reported by Syverton and associates (7) represent the first recognition of a widespread occurrence of this virus in association with human illness.

The variation in the geographic distribution of this virus in the six midwestern States is worthy of comment. Obviously, this virus appeared in epidemic proportions in Iowa. Of the 329 Iowans studied, about 53 percent yielded the B5 virus, while only about 2 percent yielded polioviruses. In contrast, none of the stools from 104 patients in Arkansas yielded Coxsackie viruses, while 36 percent were shown to contain polioviruses. In Kansas and Missouri, polioviruses were more commonly encountered than the B5 virus, while both viruses appeared in about equal frequency in Nebraska. The number of specimens obtained from Oklahoma was too small for reliable comparison.

Suggested as a factor producing variations in geographic distribution of Coxsackie B5 virus is the apparent incompatibility of Coxsackie B and poliovirus infections. In the laboratory Coxsackie B infections appear to exert an interfering effect on poliovirus infections in mice (8, 9) as well as in tissue cultures (10). Field observations also suggest that such interference may occur in man, and the evidence in favor of this hypothesis has recently been reviewed by Dalldorf (11). A high incidence of Coxsackie B infection is usually accompanied by a low incidence of polio-

myelitis, and furthermore, when Coxsackie B and poliovirus infections occur simultaneously in the same area, the peak incidence of Coxsackie infection usually precedes that of poliovirus infection by 1 or 2 months (12).

Besides the possibility that it represents the effect of interference, the high incidence of Coxsackie B5 virus infection associated with a low incidence of poliovirus infection can also be explained by certain ecologic and immunological factors. They might be the impact of past infections, resistance acquired through vaccinations, balance of immune and susceptible persons, and the introduction of a new virus into a population. The observations made in Mason City (1) as well as those reported here for other parts of Iowa indicate that the residents of that State were highly susceptible to Coxsackie B5 virus infection. Hence, introduction of this virus into the State, under favorable conditions, would result in an epidemic. On the other hand, the population of Iowa was relatively resistant to poliomyelitis as a result of past infections, and their immune status had been reinforced by the recent use of the Salk vaccine.

A review of the Iowa data for the past 3 years shows that when the Salk vaccine was first introduced in 1954 there were 1,445 reported cases of poliomyelitis, 525 (36.3 percent) of which were paralytic. In 1955, the number dropped to 556, with 114, or 20.5 percent, paralytic. During the following year there were 580 cases, but only about 8 percent were paralytic. This decline in incidence and in the ratio of paralytic cases coincides with

the introduction and continued use of the Salk vaccine.

As for age distribution of those infected with the B5 virus, rates of infection were approximately the same for persons under 20 years of age in both ill and well categories. These rates were significantly higher than those of the older group. This difference in age-specific incidence indicates that the older population was more resistant to Coxsackie B5 virus infection, possibly because of infection some years ago with an agent similar or antigenically related to Coxsackie virus B5. The uniform infection rates among persons in younger age groups further suggest that Coxsackie virus B5 probably had not been active in Iowa during recent years.

Summary

During the summer of 1956 Coxsackie virus was found widely distributed in several mid-western States. Infections due to this virus appeared in epidemic proportions in several localities in Iowa; about 53 percent of the stools examined yielded Coxsackie virus B5, while about 2 percent contained polioviruses. The frequency of isolating the B5 virus in Kansas, Missouri, and Nebraska ranged from 8 to 12 percent. In Arkansas, none of 104 individuals examined yielded Coxsackie viruses, while 36 percent had polioviruses. One strain of Coxsackie virus B5 was isolated from 15 individuals examined in Oklahoma.

Studies in Iowa also showed that the seasonal incidence of Coxsackie B5 infection was similar to that of poliomyelitis. The frequency of detecting this virus was higher among persons under 20 years than in those over 20 years of age.

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Correction

In Home Safety Activities, *Public Health Reports*, May 1958, page 455, change "National Health Council" to "National Safety Council."

publications

A Manual on Recordkeeping and Statistical Reporting for Mental Health Clinics

PHS Publication No. 539. 1957. 72 pages; illustrated. 45 cents.

Methods and record forms evolved by clinics, States, and the National Institute of Mental Health, Public Health Service, for routine recording, collection, and compilation of selected items of information about patients and the services they receive in outpatient psychiatric clinics are presented in this manual.

The procedures are designed to provide the minimum of essential data included in the Annual Statistical Report of Outpatient Psychiatric Clinics, which is the report used in a national reporting program developed by the National Institute of Mental Health. The suggested procedures also take into account some variation in need by clinics and States for data beyond those collected nationally as well as differences in availability of clerical and statistical personnel and equipment.

Evaluation of Obstetric and Related Data Recorded on Vital Records and Hospital Records: District of Columbia, 1952

Vital Statistics—Special Reports. Selected Studies. Vol. 45, No. 13. Nov. 20, 1957. By Ella Oppenheimer, Samuel Schwartz, Alexander L. Russell, Matthew Tayback, and Eleanor P. Hunt. Pages 359-416; tables. 40 cents.

This study concerns the collection, development, and use of medical information reported on birth certificates. A sample group of 1,000

births in the District of Columbia's major hospitals is used to evaluate the accuracy and completeness of reporting such items as birth weight, period of gestation, conditions of pregnancy and labor, and method of delivery. The medical information on the birth certificates is compared with matched hospital record data. The method and the findings are given in detail.

A second phase of the study demonstrates the use of medical information from birth and stillbirth certificates and hospital records in showing significant relationships between obstetric factors and the outcome of pregnancy.

The report concludes with a summary of actions taken in the District of Columbia to develop and improve medical information derived from birth certificates.

Health Statistics From the U. S. National Health Survey

Preliminary report on volume of physician visits, United States, July-September 1957

PHS Publication No. 584-B1. 1958. 25 pages; tables. 25 cents.

Preliminary report on volume of dental care, United States, July-September 1957

PHS Publication No. 584-B2. 1958. 22 pages; tables. 25 cents.

First and second of a new series (Series B), these reports present data from household interviews conducted by the U. S. Bureau of the Census for the Public Health Service. The first report estimates the number of physician visits per person, by age, sex, and rural-urban residence. It gives the distribution by type of service and by place of visit (home, physician's office, hos-

pital clinic, or other) and shows the time interval since the last physician visit.

The second report estimates the volume of dental visits classified according to sex, age, urban-rural residence, and type of service (fillings, extractions, cleaning teeth, examination, denture work, straightening, gum treatment, and other). It also shows distribution of the population according to interval since last dental visit, by age, sex, and urban-rural residence.

Notes on methods and definitions of terms are given in the appendixes in each publication.

An Outline of Venereal Disease Management

PHS Publication No. 573. Revised 1957. 14 pages. 15 cents.

Information on diagnosis and management of venereal diseases is brought up to date in this revised booklet. Suggested epidemiological techniques and followup procedures are included, as well as detailed schedules of treatment for syphilis, gonorrhea, nonspecific urethritis, saprophytic spirochetal balanitis, chancroid, granuloma inguinale, and lymphogranuloma venereum.

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